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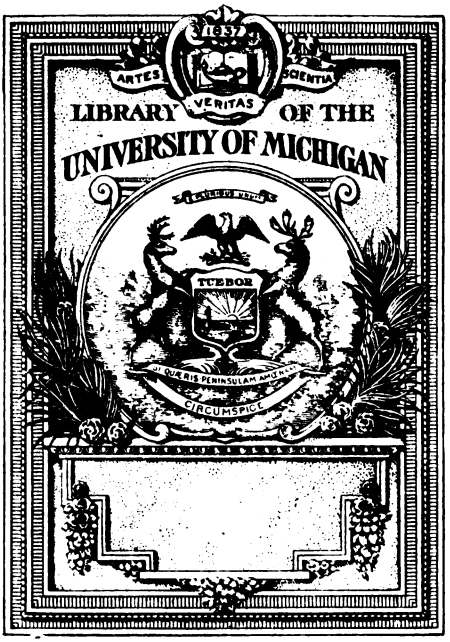
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WESTERN LIVE-STOCK MANAGEMENT

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WESTERN

LIVE-STOCK MANAGEMENT

EDITED BY

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PROFESSOR OF ANIMAL HUSBANDRY AT THE
OREGON AGRICULTURAL COLLEGE

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AT THE OREGON AGRICULTURAL COLLEGE

New York
THE MACMILLAN COMPANY
1917

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Set up and electrotyped. Published August, 1917.

Norwood Press
J. S. Cushing Co. — Berwick & Smith Co.
Norwood, Mass., U.S.A.

PREFACE

THIS book is prepared for the use of all who wish to obtain a knowledge of the methods and problems of live-stock production in the West. We have tried to give the reader an idea of live-stock conditions as they actually exist and to avoid advocating new or untried systems of breeding or management; in other words, we have tried to record what the western stockmen are doing rather than to advise what they should do. Methods now in vogue are doubtless far from perfect, but we believe that all real improvement must be based on an accurate knowledge of present practices. We are, therefore, presenting here the information which experienced stockmen already possess, but which the young man or the beginner often finds slow and expensive to acquire.

In the absence of a text on this subject, the material here presented was originally prepared for the use of a class in Live-Stock Management at the Oregon Agricultural College. It was first published as mimeographed notes, later as printed circulars, and appears in its present form only after many revisions.

ERMINE L. POTTER.

CORVALLIS, OREGON,
April 1, 1917.

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PART I

GENERAL CONDITIONS

By Ermine L. Potter

CHAPTER I

THE WEST

WHAT is the West? The very word "West" is fascinating, full of inspiration and attainment. We have all felt the impulse of Greeley's wise advice, "Go west, young man." Not only do we want to be in the West ourselves, but every state and every country wants to be a part of the West. Probably the only countries that do not claim to be West are India and China. Japan no longer admits herself as being eastern, but now claims to be the West, to say nothing of the western pretensions of the remainder of the world, from New York to Petrograd. But regardless of the claims of others, there is in the minds of the American people but one West and that is the great region lying between the one-hundredth meridian and the Pacific Ocean. In this book we shall deal exclusively with this territory, comprising the western parts of the Dakotas, Nebraska, Kansas, Oklahoma, and Texas, and the whole of the eleven states of Montana, Wyoming, Colorado, New Mexico, Idaho, Utah, Arizona, Nevada, Washington, Oregon, and California.

TOPOGRAPHY

With the exception of some areas in the extreme west and southwest, all of the territory considered under the general term of "The West," as used in this book, lies at

an altitude of 2000 feet or more. The 2000-foot contour line runs north and south through the United States following almost accurately the one-hundredth meridian and it is only a short distance west of that line to the 3000-foot contour and east to the 1000-foot contour. (See Fig. 1.)

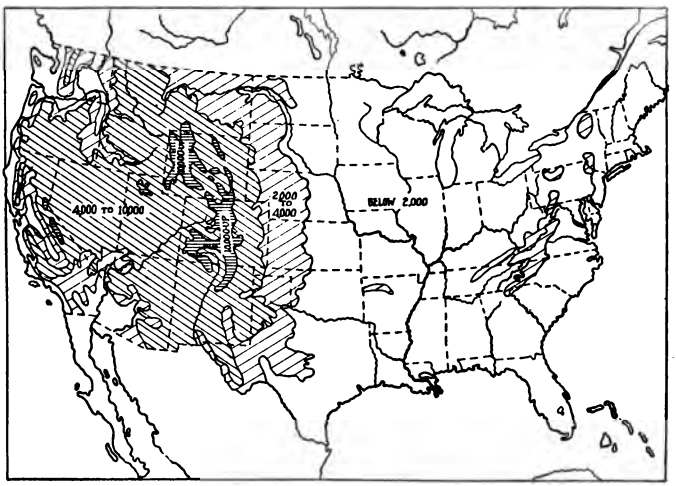


FIG. 1. — Altitude Map of United States.

A high altitude, however, is about the only feature of topography which is nearly universal in this region. There is every possible variation of surface; immense plains almost absolutely level, rolling hills, and the wildest and most rugged mountains. The soil varies from the richest and deepest to solid rock. Generally speaking, however, the soil of the West, wherever the country is not too rough and rocky for tillage, is of extreme richness, whether it be in the lower valleys or on the rolling hills.

CLIMATE

The most noticeable feature of western climate is the limited rainfall, which is fairly well indicated in the accompanying map (Fig. 2). It will be noted that with the exception of those parts of Oregon and Washington lying to the west of the Cascade Mountains, almost this

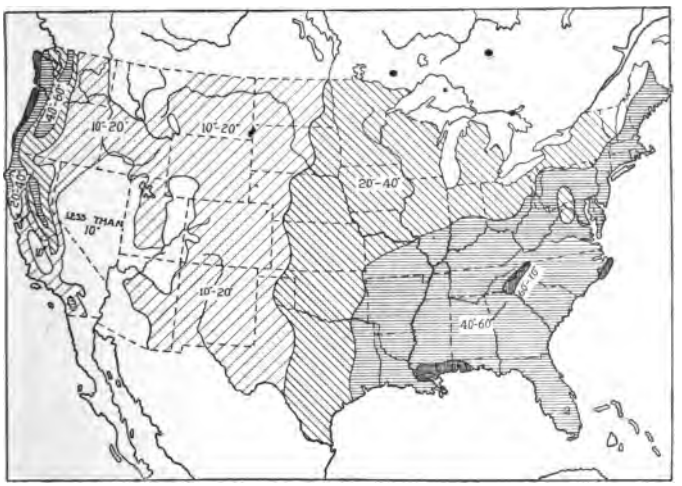


FIG. 2. — Annual Rainfall of the United States.

entire region has less than 20 inches of rainfall, while some parts, as in southern Nevada and Arizona, have even less than 10 inches. This dry climate, combined with the high altitude, tends to make the summers rather cool, particularly at night, although it may be quite warm in the sun during the day. The winters in such states as Arizona and New Mexico are very mild, while farther north, as in Montana, they are severe. The extreme dry-

ness of the atmosphere tends to counteract to a marked extent the effects of any unusual temperature; therefore, the climate of the West is on the whole much more pleasant to both man and beast than in the central and eastern part of the United States. There are but few localities where cattle or sheep will not do reasonably well in the open range or pasture without shelter of any kind. The absence of extreme wet and sleety storms, such as occur in the eastern states, makes it unnecessary to provide much shelter, even where the temperature becomes very low. As we approach the Pacific Coast, we reach a country in which the climate is modified by the influence of the Japan current. The western part of Washington and Oregon has exceedingly mild winters and a rainfall three or four times that in other parts of the West. The dividing line between this humid area and the drier districts is distinct and follows quite accurately the crest of the Cascade Mountains as far south as the Siskiyou Mountains on the Oregon-California boundary, and then follows the crest of the Coast Mountains nearly to San Francisco. Along this boundary a distance of 50 miles east and west will take us from a region of eight or nine months' growing season with a rainfall of 40 to 60 inches and practically no snow in winter to a region of not to exceed 90 days' growing season, and a rainfall of less than 15 inches.

Midsummer is the dry season in nearly all parts of the West, and the months of July and August have but little rainfall, even in the humid regions of the North Pacific Coast. The exceptions to this are western Texas, Arizona, and New Mexico. In Arizona and New Mexico most of the precipitation comes in July and August, with a secondary rainy season in midwinter, while in western Texas, there is little regularity as to either rainfall or drouth.

In the various discussions of live-stock raising in the West which follow, the reader may assume that we refer to the higher and drier districts unless otherwise indicated.

GRAZING AREAS

The West may be considered as one great grazing ground or range. The term "range" is applied to all the grazing lands of the West where the area is large and the carrying capacity small. There are stockmen who

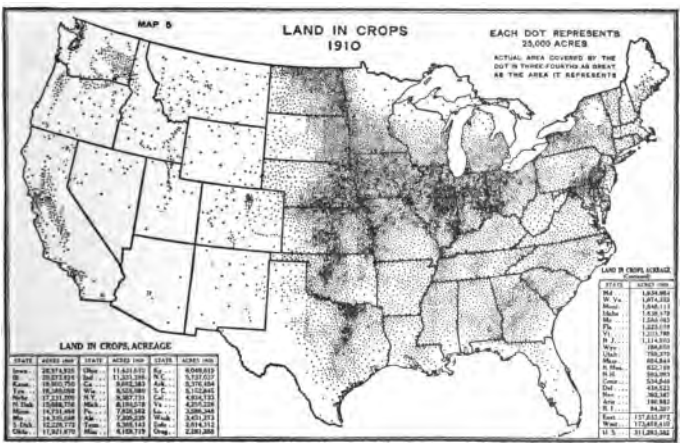


FIG. 3.

restrict the use of the word to grazing areas that are not fenced, but this definition is not generally accepted. For example, we hear much of the "ranges" of Texas, yet nearly all of the grazing land of that state is fenced. The accompanying map (Fig. 3) showing the land in crops will indicate at once the very small portion under

cultivation. That which is not under cultivation is almost entirely range, although there are limited areas so exceedingly rough and mountainous or so heavily timbered as to afford no grazing.

From the standpoint of ownership and legal control, the lands of the West are of several classes, as shown by the accompanying table:

CLASSIFICATION OF WESTERN LANDS

	TOTAL AREA IN ACRES	ACRES IN CROPS	ACRES UNAPPROPRIATED	ACRES IN FOREST RESERVE	MISCELLANEOUS PRIVATE OWNERSHIP, MOSTLY GRAZING
Arizona . .	72,838,400	190,982	39,525,195	12,288,125	20,834,098
California .	99,617,280	4,924,733	20,853,637	19,532,731	54,306,179
Colorado .	66,341,120	2,614,312	19,353,231	13,107,681	31,265,896
Idaho . .	53,346,560	1,638,479	17,915,622	17,719,972	16,072,487
Montana .	93,568,640	1,848,113	21,542,853	16,104,734	54,072,940
Nevada . .	70,285,440	392,387	55,138,593	5,287,710	9,466,750
New Mexico	78,401,920	632,769	31,298,621	8,470,043	38,000,487
Oregon . .	61,188,480	2,281,288	16,545,522	13,123,010	29,238,660
Utah . .	52,597,760	755,370	33,837,596	7,449,160	10,555,634
Washington	72,775,040	3,431,273	1,750,208	9,953,166	57,640,393
Wyoming .	62,460,160	786,650	32,255,679	8,385,288	21,032,543
Total . .	783,420,800	19,496,356	290,016,757	131,421,620	342,486,067

By far the larger portion still belongs to the United States government and is therefore designated as federal or government land. This federal land may be subdivided as reserved and unreserved.

Reserved lands.

The reserved land is mostly Forest Reserve, which is grazed only by the possessors of permits obtained by application to the Forest Supervisor. In the allotment of these permits, preference is given to ranchmen owning

improved ranches in or near the Forest Reserves. Second preference is given old users of the range who reside at a distance. Last consideration is given new non-resident owners. The fees for grazing are not the same on all ranges, but for year-long permits are usually within the following limits:

Sheep, 15–16 cents a head a year
Cattle, 60–64 cents a head a year
Horses, 75–80 cents a head a year
Swine, 36–38 cents a head a year

For a grazing period of less than a year, the charge for a month is about one-tenth of the annual fee. Since the Forest Ranges include most of the higher elevations, the year-long permits are confined to the Southwest, while in the northern states the permits are usually for less than six months, and commonly for only four. When the Forest Reserves were first established, there was much friction between the Range officials and the stockmen, but the system has finally been adjusted so as to be reasonably fair to all, and the stockmen now have much better control over their grazing lands than under the open range system. The Forest officials act largely in coöperation with the local stockmen's associations and the stockmen know definitely what they may expect.

The 210,000,000 acres of Forest Reserve pay no taxes, but 35 per cent of the receipts goes to the counties in which the range is located for the construction of roads and trails anywhere within the county and 10 per cent for roads and trails exclusively within the Reserve. In this way, they help support the local governments, although to a much less extent than if they were deeded lands subject to the usual rates of taxation.

Beside the Forest Reserves, some small areas are reserved as Indian Reservations, power sites, and the like. Grazing on Indian Lands is under control of the Indian agents, while the power sites are subject to no grazing regulations.

Deeded lands.

A considerable part of the grazing lands belongs to private owners. Some of this land is owned by stockmen and some by timber companies, road companies, and other large interests. The grazing lands belonging to stockmen are mostly under fence. The lands belonging to the big commercial corporations have in most cases been held for other purposes than grazing, and until recently have been grazed by anyone who wished to do so. Within the last few years many of these lands have been leased or sold to stockmen and are being fenced. By far the largest area of deeded range is in Texas, where there are no Forest Reserves and no government land. When Texas joined the Union, she retained the ownership of all her unoccupied lands, and has since sold or leased them to stockmen.

Unappropriated lands.

The unappropriated lands are those which have not been reserved by the national government for forest or other purposes and which have not yet been considered of sufficient value to be worth homesteading. Anyone may use these unappropriated lands for grazing or for any other purpose, but cannot legally prevent anyone else from using them by fencing or in any other way except by the ownership of all the available water. If

there is no water on any given area, the only person who can use it is the man who has water on his own land near enough to supply his stock. There is still in the West 290,000,000 acres of this "free" range, but it is not as much of a gift as it looks. Owing to the lack of rains, the grass grows only a short time; however, since the mature grass cures down into a good feed, satisfactory grazing may be obtained at any time of the year that the ground is not covered with snow, providing the grass was not all eaten off as fast as it came through. With free range, no one has control and consequently the man who tries to save a little grass for the dry season or winter may be only saving it for the other fellow. Consequently, everyone gets what he can while it is growing and during the dry season may have to do without. This necessitates feeding an undue amount of hay, makes poor stock, and eventually ruins the grass.

Most of the deeded lands outside of Texas were obtained from the government by the Homestead Act. Smaller amounts have been obtained under the Swamp Act, Timber and Stone Act, Desert Act, Script, Lieu Lands Act, and various other acts or laws providing for the taking up of government land. At the present time the Homestead Act is the only one applicable to any large areas.

Winter and summer ranges.

Summer ranges are those on which the grazing is best in midsummer. Such ranges are found almost entirely in the mountains where the winter snows are deep, and since these higher elevations are mostly in the Forest Reserves, a map of the National Forests is a crude map of the summer ranges. The grass is very dry in the lower

plains and valleys during July and August, and in this season all ranchmen run their stock in the mountains if possible. Green grass in midsummer is very helpful to all kinds of live-stock, but is imperative for ewes and lambs, hence the very keen interest of the sheepmen in the administration of the Forest Reserves. Owing to severe spring and fall storms in the mountains, the season on the summer ranges is rarely longer than four or five months.

Winter ranges are those on which the grazing is best in the winter or in the spring and fall. The term "winter range" is used throughout the West, but about the only place where the grass is really best in midwinter is in certain parts of Arizona and New Mexico. Elsewhere "spring and fall" range would describe the condition more accurately, since outside of the mountains and high mountain valleys the best grazing is at these seasons. If the grass is allowed to mature and the snowfall is light, it will furnish fair feed all winter. The sage-brush and other shrubs will also help, especially with hungry sheep, but outside of Arizona and New Mexico, these ranges cannot be depended on to carry the stock through the winter unless supplemented with hay. The usual system is four months on hay in the winter, two months spring grazing on the lower altitudes, or "winter ranges," four months in the mountains on the "summer range," and then back on the "winter range" for two months' fall grazing. There are some exceptions to this but in no case does the stock run on the same land throughout the year.

Range grasses.

Most of the ranges outside of the mountains are covered with sage-brush, especially in the more northern

regions, while to the south the sage-brush is replaced by the chaparral and other similar shrubs. Scattered through it all is some grass, the species varying with the locality. In these dry climates there is a marked tendency for the grass to grow in clumps or bunches instead of scattering over the entire surface as a sod. This bunching tendency gives the name of "bunch-grass" to the grasses grown in such a climate. The name "bunch-grass," therefore, is not the name of any particular species or variety. The feed on western ranges is not confined to the grasses, but is supplemented by the innumerable weeds and shrubs. In the mountains there is a great abundance of miscellaneous plants which afford some grazing.[1] In the lower altitudes the stock eat little except grass during the summer, but consume large quantities of sage-brush and other browse in the winter when the grass is all gone or covered with snow.

Carrying capacity.

The western ranges are at the best of low carrying capacity, but the enormous area makes up for the small production of each acre. An apparently large ranch in the range country may support but a limited amount of stock and produce only a very moderate income.

The extent to which the Forest Reserves of the West are grazed is shown by the accompanying table:

[1] The number of these forage plants, as well as of the grasses, is too great to permit discussion of them in this book. Readers desiring more complete information of range plants should refer to such works as "Western Grazing Grounds," by W. C. Barnes, or to the various technical bulletins put out by the United States Department of Agriculture and by the experiment stations of the western states.

STOCK GRAZED ON NATIONAL FORESTS OF WESTERN STATES FOR FISCAL YEAR 1915

STATE	ACREAGE OF NATIONAL FOREST	CATTLE	HORSES	HOGS	SHEEP	GOATS	CATTLE EQUIVALENT	ACRES PER COW EQUIVALENT
Arizona . . .	12,288,125	288,875	7,900	565	389,657	4,490	362,560	33.8
California . .	19,532,731	176,616	10,383	1,644	390,962	6,644	253,541	77.0
Colorado . .	13,107,681	301,208	9,124		629,940	1,323	415,542	31.5
Idaho. . . .	17,719,972	108,500	8,976	159	1,594,726		383,290	46.2
Montana . .	16,104,734	133,560	16,405		730,507	850	271,858	59.2
Nevada . . .	5,287,710	74,077	5,709		454,615		155,555	33.9
New Mexico .	8,470,043	101,293	4,873	183	405,280	37,839	180,050	47.0
Oregon . . .	13,123,010	108,777	10,745	66	769,323	263	247,797	52.9
Utah	7,449,160	171,253	12,899	4	919,834		337,458	22.0
Washington .	9,953,166	15,977	1,256		238,824		57,037	174.5
Wyoming . .	8,385,288	106,506	5,018	2	707,622		229,461	36.5
Total stock grazed in Reserves . . .		1,576,642	93,288	2,623	7,231,290	51,409	2,894,149	72.8
Total stock in the 11 states		8,235,000	2,889,000	2,972,000	27,711,000			
Per cent grazed in Reserves .		19.1%	3.2%	.09%	26.1%			

In this table it must be remembered that the carrying capacity of the Reserves is figured on the basis of the total area and no deductions are made for those parts which are so rough or so heavily timbered that no grazing is possible. The heaviest timbered areas are found toward the North Pacific Coast where the rainfall is greatest. The Washington Reserves are nearly all in the rain belt, hence the comparatively low grazing capacity shown in the table. The roughest Reserves are found in the heart of the Rocky Mountains, as in Montana. The carrying capacity of the various sections is illustrated in the following tabulation concerning the Reserves of Oregon. The Coast Mountains are in a region of excessive rainfall and very heavy timber. The Cascade Mountains are partly in this belt, but extend over into the semi-arid section. Eastern Oregon, on the other hand, is in the typical semi-arid region of ten to twenty inches of rain and so has much less timber and much more grass.

Outside of the heaviest timber and roughest mountains, about thirty to forty acres of mountain or forest range will be required for each cow. This is summer range only. In addition, grazing on the lower hills and plains or "winter ranges" must be provided for spring and fall. In the regions of fifteen inches or more rainfall, ten to fifteen acres will support a cow during this season, while twenty-five to fifty acres will be needed where the rainfall is only ten inches. If no hay is used for winter, another twenty-five to fifty acres is needed. Under favorable conditions one ton of hay and a total of forty acres of grass will support a cow. Selected tracts might do a little better than this. On the other hand, there are thousands of cattle in the West that require more than one hundred

GRAZING ON NATIONAL FORESTS OF OREGON

NATIONAL FOREST	NET AREA	CATTLE AND HORSES	SHEEP	CATTLE EQUIVALENT (SIX SHEEP TO ONE COW)	ACRES PER COW EQUIVALENT
Siskiyou	981,949	4,000	3,000	4,500	218.21
Siuslaw	544,396	1,200	4,000	1,267	429.67
Total, Coast Mts.	1,526,345	5,200	7,000	5,767	264.67
Oregon	1,030,132	2,000	30,000	7,000	147.16
Santiam	588,336	300	24,000	4,300	136.82
Cascade	1,019,737	900	33,000	6,400	159.33
Umpqua	949,052	1,000	12,000	3,000	316.35
Total, Cascade Mts.	3,587,257	4,200	99,000	20,700	173.30
Crater	748,960	8,000	10,000	9,667	77.48
Deschutes	804,794	3,000	43,000	10,167	79.16
Fremont	779,941	11,000	105,000	18,500	42.16
Klamath	5,640				
Malheur	1,057,842	24,000	130,000	45,667	23.16
Minam	400,767	10,500	60,500	20,583	19.47
Ochoco	716,576	10,000	107,000	27,833	25.17
Paulina	802,144				
Umatilla	490,884	11,000	77,000	23,833	20.59
Wallowa	999,260	15,000	120,000	35,000	28.59
Wenaha	429,462	10,000	100,000	26,667	16.11
Whitman	877,540	8,300	113,500	27,217	32.25
Total, eastern Oregon	8,113,810	110,800	866,000	245,134	33.10

acres a head. Six sheep consume about as much feed as a cow, while a horse will need slightly more.

Homesteaders.

The statement is often made that the open ranges of the West are a thing of the past and that the homesteader has taken them all up and put them under the plow.

The map showing the area under cultivation contradicts these statements. On the eastern slope of the Rocky Mountains there have been large areas put under the plow in the last fifteen years, but west of the Rocky Mountains there have been but comparatively small changes in the cultivated area for twenty or twenty-five years. It is true that much land has been homesteaded in that time, but very few of these homesteads are under cultivation. In fact, a very large proportion of the homesteaders who have not "proved up" are not expecting to stay any longer than necessary to obtain title to the land, and those who have "proved up" and obtained their patent have moved away and their land has been either abandoned or sold or leased to the ranchmen. The process of putting the range lands under cultivation is, therefore, going very slowly. The lands now untaken are, for the most part, so rough and rocky as to be absolutely impossible of cultivation. This is especially true of some of the better grazing lands. On the other hand, there are areas small in extent, as compared with the whole area of the unappropriated lands, yet containing several million acres of fairly good soil, comparatively level, which can be plowed and seeded with the minimum of expense; but these lands are either very dry or very frosty or both, and so far no one has developed a system of farming that will make them produce a profitable crop. The development of the science of dry-farming has already put under the plow thousands of acres formerly considered worthless and it is possible that these remaining areas of tillable land may some day be farmed, but it will require the use of crops or methods at present unknown. This, however, applies only to the tillable area. The big areas of the range cannot be plowed and are suit-

able for grazing only. The Homestead law has been a remarkable instrument as applied to the tillable portions of the United States, but with its present limitations, it is not applicable to the grazing lands of the West, where it requires from fifteen up to 150 acres to support a steer through the grazing season. Under the Homestead Act, the applicant is given 160 acres of land in return for living on the same for a term of years, and putting a certain portion under cultivation. All of the desirable lands have been taken up and put under private ownership by this method, but with the remaining untillable areas where 160 acres of land will not support to exceed ten head of cattle, and probably in extreme cases only one or two, the homestead act is not applicable, since there is no way in which the homesteader can make a living raising stock on the amount of land allotted him. Recently the homesteads have been enlarged to 320 acres in many parts of the West, but this does not make any material change in the situation, since even 320 acres is far from enough to support a family in the range stock business. With the land now being homesteaded, the homesteader does not pretend to make a living on his land, but rather by employment obtained elsewhere. The desirability of a homestead is now dependent more on available employment than on the value of the land. It was expected that by developing a farm home, the applicant should render the community a valuable service and in return he should receive the title to his land. At present he does not develop a home, and consequently renders the government no service, although he is obliged to live where he should not live and to cultivate land which should not be cultivated, thus undergoing bitter hardships and deprivations, which do no one any good, but really much

PLATE I. — CHEAP GRASS IS THE BASIS OF WESTERN LIVESTOCK PRODUCTION.

harm, since the community is deprived of much of the homesteader's labor, while his children are deprived of the social and educational advantages to which they are justly entitled.

Range improvement.

Most of the range grasses reproduce by seed and if eaten down so close that they never mature seed, they are finally killed out. On the other hand, if they have a chance to grow and produce mature seed, they will hold their own indefinitely. Fortunately, after the seed has matured and shattered out, the remaining dry grass makes a good feed, and thus no grazing need be lost. The Forest Service and the various state experiment stations have conducted many investigations into the re-establishment of the ranges and have obtained splendid results from what they call the "deferred grazing" system. This is simply holding the stock off until after the grass has made seed and then turning them on and letting them eat the grass and tramp the seed into the ground. In order properly to take care of the stock, the range is divided into four parts and grazing deferred on one part this year, on another the next, and thus rotating so as to defer the grazing on each part once in four years. There is no loss of feed by this system and the ranges are greatly improved. Results are not only cheaper but better obtained by this method than by artificial seeding or by keeping stock off for a whole year.

Legal difficulties.

Cheap and effective as the deferred grazing system is, it cannot be applied to the government lands. With

"free" range, there is no way to keep the cattle off until the seed matures and the ranges must constantly deteriorate. Furthermore, these 290,000,000 acres of unappropriated lands contribute no taxes to the support of either county, state, or national government, but are supplied with schools and roads from taxes on other land and property. In many western counties, 75 per cent or more of the land is unappropriated and the taxes on the remaining 25 per cent are necessarily very heavy. The stockmen themselves are helpless in the matter and are in no way responsible for these disastrous results. On the contrary, the blame is due to the laws which force this situation on the West, and these laws are in turn due to Congress which is finally responsible to the people of the United States — in other words, you and me. The vast bulk of our population live in the cities and in the eastern parts of the United States, where land values are high and where a thousand or two thousand acres of land is a princely fortune. They cannot realize that a thousand acres of this range will not in most cases support a family and they feel that when the federal government gives the homesteaders 160 or 320 acres, the government is already being grafted out of "good farms." Then to add to this feeling, there has been the great agitation for intensified farming and the ten-acre farm has been praised in song and story until the public was ready to believe that ten acres anywhere would support a family if "farmed right."

Within the last year or two, the pendulum of public opinion has started in the other direction and it is possible that we may shortly be able to get a careful and unbiased judgment on the matter. The remedy must be a legal one and must make it possible for the stockmen

to adopt better methods of range management. In a general way there are three possible methods of procedure. First, to sell the land to the highest bidder; second, to lease it to the stockmen, either as a direct lease of certain areas or by grazing under permit as is now the case in the National Forests; third, to permit the homesteading of the land in quantities sufficiently large to support a family and to induce settlers actually to take up the land. The stockmen would prefer one of the first two and doubtless from the general good of the country, one or the other of these methods would be best. The third, however, or some modification of it, is apparently most likely to get through Congress, since it would do most to put the land into the hands of the man with no money. The stockmen now on the ground have almost all used their homestead rights. The land would, therefore, have to be taken up by new persons. The western homesteaders do not have and cannot get the money to stock up these ranges; they are by training and natural ability not adapted to the range stock business; and the minute a patent for the land would be obtained, it would be on the market with the stockmen as possible purchasers. The stockmen would eventually get it but the buying and selling would be a cut-throat game on both sides. The proper use of this land often depends so much on the ownership or control of adjoining lands that many factors other than the actual productive value of the land itself would enter into the deal, sometimes to the advantage of the stockman and just as often to the advantage of the homesteader. In the long run, things would probably work out all right but the stock business would be much demoralized for a period of several years. If such a homestead system be adopted, the homesteads must be

large if the law is to be effective. At the present moment, there is a law before Congress for a 640-acre grazing homestead. Six hundred and forty acres is too small and if such a law be passed, it will not affect any large portion of the range lands. If, however, the ranges were classified and the homestead in each case made large enough to support a family, whether that be two sections or ten, the law would really be effective. Another way in which the result might be reached more cheaply and quickly would be to fix the size of the homestead taken the first year at one section, those taken the second year at two sections, the third year, three sections, and so on until all of the land was taken. This would leave the classification to the judgment of the homesteader and he could take his choice whether he would homestead a section the first year or wait until the next and get two sections of what was left by that time.

The leasing system would put the range under control with the least difficulty. It would not involve a vast shifting of population as would be required by homesteading or the enormous influx of capital and outflow of interest which the sale of the land would necessitate. The men who are now in the country, the men who have already built homes and roads and schools, would be given a positive control of the land they now use in the support of their families. For this they would pay a small annual rental, a sum within their means, and a sum for which they would receive immediate and compensating returns. On the other hand the rental in the public treasury would be most useful in the further building of roads and schools and in the general support of the community, whereas under the present system, these 290 million acres must have roads and schools and a general

government, but do not contribute a dollar for the support of the same.

After the land is once under control, regardless of the method by which this result is obtained, improved methods of management may be expected. Deferred grazing will be practiced to improve the grass, while fencing will reduce the cost of handling, lessen the amount of range required, permit the use of better stock, and lastly give a permanence and stability which the industry does not now possess.

CULTIVATED AREAS

According to the latest available statistics put out by the United States Department of Agriculture in the 1915 Yearbook, there are in the eleven states lying entirely within the region under discussion, a total of nineteen million acres of land actually in crop. The significance of these figures is shown by the fact that these eleven states comprise nearly one-half the total area of the United States, yet from the standpoint of cultivated lands, there are three states of the Union any one of which contains more land actually in crop than the entire eleven states of the West. For example, Kansas alone contains almost twenty million acres of land in crops, while Illinois and Iowa each contain a little more than twenty million acres.

The cultivated areas of the West are of three distinct classes: irrigated, dry-farm, and humid. The irrigated sections comprise small scattered valleys always of limited area. The chief crop in these irrigated valleys is alfalfa, although considerable grain is grown in some sections together with fruit of various kinds. These valleys are perhaps best known for their fruit production but from the standpoint of real importance, either as money or

acreage, alfalfa is by far the biggest crop. The dry-farm sections are farmed under the dry-farm system, which is essentially summer fallow and careful tillage adapted to using two years' moisture for the growing of one crop. These lands are largely on the rolling hills which have a good soil and an annual rainfall of twelve to twenty inches. The largest dry-farm areas are found in the

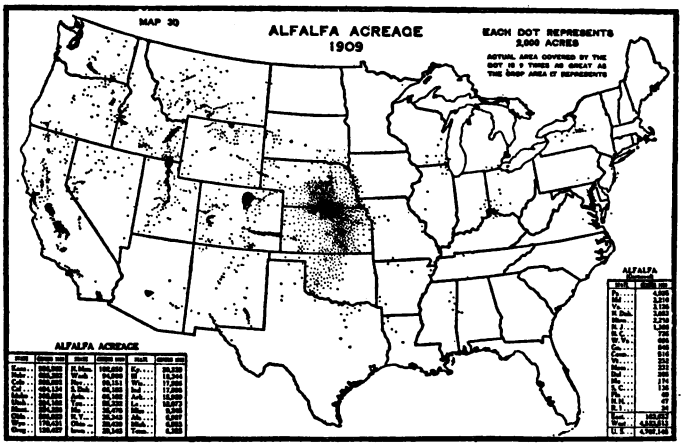


FIG. 4.

eastern parts of Montana, in the Columbia Basin in eastern Oregon and Washington, and in the central valleys of California. The big crop in the large dry-farm areas, and in fact very commonly the exclusive crop, is wheat. In some places rye is grown as a hay or forage crop, and farther south the sorghums, milo maize and similar drouth-resistant plants are grown as a feed for stock. These areas, however, must be considered very largely as wheat-growing districts and they produce live-stock only on a limited scale, with the exception of horses.

Large numbers of fine horses are raised and used on the wheat ranches.

The humid district is confined to the western part of Washington and Oregon, with the larger portion of the good tillable land in the latter state. Since this humid section is confined to one small locality, and isolated from the remainder of the country by a great mountain range, it is not of so much interest to most persons of the West, as are the alfalfa and dry-farm sections which are scattered over a much larger area. This humid section, however, does comprise about 15 per cent of the tillable land of the West. It is a region of immense variety from the agricultural standpoint, and practically every crop grown in the temperate zone is grown here in commercial quantities. The chief crops are hay, grain, and pasture, while the chief live-stock industry is dairying and farm sheep. Fine pure-bred stock are especially numerous and this region must be considered as the breeding ground of the West.

DISTRIBUTION OF LIVE-STOCK

The distribution of live-stock is perhaps best shown by the maps (Fig. 5). In a general way cattle and sheep are well distributed throughout the western country, and all of the grazing area supports more or less of these animals. There are very few sections which are exclusively cattle or exclusively sheep, although in a general way the regions having the greenest and best grass in the summer time attempt to raise the larger number of sheep, while the regions that are comparatively dry and have little green grass are more largely devoted to cattle. There are but few beef cattle raised entirely on cultivated

land and almost no sheep except in the Willamette Valley. Horses are scattered throughout all parts. As the range-men and the farmers all have to use a large number

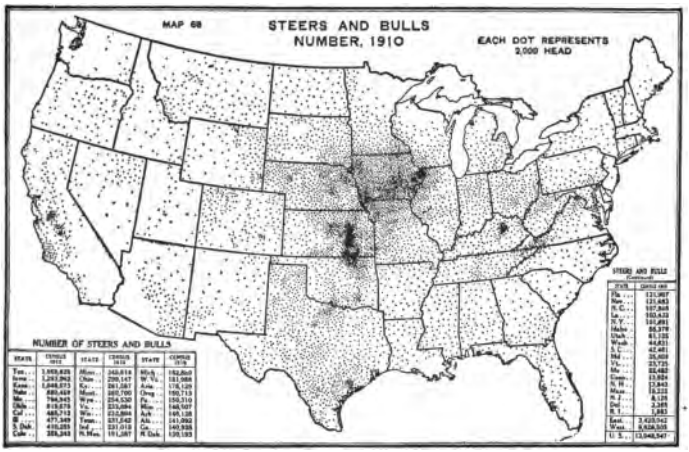


FIG. 5.

of horses, the distribution is fairly uniform, but they are slightly more numerous where agriculture is better developed and a large amount of farm work done. Hogs are confined strictly to the cultivated districts and the same is true with dairy cattle. Hogs and dairy cattle go together in the West, while the close connection between hogs and beef cattle which we find in the Corn-Belt does not exist here.

LIVE-STOCK MARKETS

A large part of the West is tributary to the big live-stock markets of the eastern states and much of the stock has an eastward drift to the markets of the Missouri

River, Chicago, and finally on toward the eastern ports of New York and Boston, some of the meat even going across the Atlantic to the big consuming centers of Europe. The general drift of all live-stock from the Rocky Mountains, and to some extent from west of that region, is eastward, in other words, from the centers of production toward the centers of consumption. In the western country, there are certain local centers of consumption which take a portion of the live-stock. These centers are Seattle, Portland, Spokane, San Francisco, and Los Angeles, of which the larger are Portland, Seattle, and San Francisco. Portland, Spokane, and Seattle handle all the stock from Oregon and Washington and part of the stock from Idaho and Montana. San Francisco and Los Angeles handle the California stock and some from Nevada. Denver is an important market but is really a part of the eastern system and the trade is largely confined to stockers and feeders on their way to the pastures and feed lots of the Corn-Belt. The shipments of stock vary according to the season and the kind of stock. In the fall all kinds of stock are more abundant than at other times. The surplus is, therefore, obliged to go to the eastern markets. The western markets all have to compete with the eastern markets along their boundary line, and hence the prices follow eastern quotations, with such variations as may be necessary to account for the difference in freight. These small western markets help materially, but it is the Chicago and Missouri River markets that really fix the price. The prices of western stock are, therefore, with a few exceptions, Chicago prices less the expenses of shipment. In any comparison of the live-stock industry of the West and of the central states, this difference of price must not be forgotten.

CHAPTER II

GENERAL PRINCIPLES OF LIVE-STOCK PRODUCTION

THE West is essentially a live-stock country and must remain such because of the fact that we have an immense quantity of feed in the form of grass and hay which cannot be used directly for support of the human race and which must, therefore, be converted into live-stock before it can serve any useful purpose. This includes the millions of acres of grass, the alfalfa produced in the irrigation sections, and the straw, stubble, and waste from the grain fields and meadows. On the cultivated farms the great value of live-stock is to consume waste which would otherwise be unmarketable, and to maintain the fertility of the soil. About the only part of the cultivated areas of the West in which fertility has in any way materially diminished up to date is in the humid sections of western Oregon and Washington. In the other parts fertility is still very high. It behooves all farmers, however, not to allow the fertility to run down, as it is much easier to take land which is already in a good state of fertility and maintain it as such, than to take land which is run down and attempt to restore it.

BREEDING

The production of live-stock depends on two things: first, the ability of the animals to multiply or increase their kind, and secondly, their ability to grow, in other

words, to convert feed into flesh. The general science of reproduction is indicated under the head of "animal breeding" and the converting of feed into flesh and fat as "nutrition." The science of breeding is too extended to take up in this brief space. The essential point which must always be observed is the old law of, "like begets like": that is, that good breeding stock produces good offspring, and that poor breeding stock produces poor offspring, subject of course to many variations, as the offspring is seldom the exact duplicate of the parents. There are many mysteries connected with breeding, but from the standpoint of the practical man on the farm, the whole procedure is really based on the one proposition of "like begets like." The difference between the successful breeder and the unsuccessful breeder lies largely in the ability of the successful man to know and to judge accurately the kind of stock which he wants to produce, whereas the failure of the other is largely in his inability to decide accurately the kind of stock which he wishes. In other words, it is largely a question of judging, and of knowing the live-stock. Good breeders are good judges, and the farmer or ranchman who wishes to be a successful breeder must first of all become an expert judge. All the science in the world will not make a successful breeder of a poor judge. On the other hand many good judges have been successful breeders without great scientific knowledge of breeding and often, in fact, handicapped by more than useless superstitions.

NUTRITION

Nutrition includes all the processes by which food material is converted into flesh and fat. The science of breeding is concerned with the increase in numbers of

live-stock, while nutrition is concerned with growth and development of the individual. It is too large a subject to be handled in the space now available but is none the less worthy of careful consideration on the part of the stockman. The cattle- or sheep-man running stock on the range does not have so great a need for a scientific knowledge of feeding, but everyone running stock on the farm where much hay, grain, or silage is used will find it much to his advantage to have a fair knowledge of scientific feeding and especially of nutritive ratios, feeding standards, and the compounding of rations. A list of suitable bulletins and books along this line may be obtained by writing to any agricultural college.

DIFFERENT STOCK COMPARED

The different kinds of live-stock vary greatly in the returns which they give for every hundred pounds of digestible matter which they consume in their feed. For example, a hundred pounds of digestible matter fed to a good dairy cow will give a product of at least twice the money value that would be obtained from the same amount of feed fed to a fattening steer. Likewise the amount of edible solids suitable for human consumption produced by the dairy cow will be very much higher than that produced by the steer. The pig also produces a very high return both in human food and the money value of the product; every hundred pounds of digestible nutrients compares in this way very favorably with the dairy cow. The sheep, on the other hand, gives a relatively low return for each hundred pounds of digestible matter consumed, although he, as a rule, brings slightly higher returns than does the steer. The horse is of course not a

food-producing animal but the gain made on a hundred pounds of feed by a growing colt is possibly even lower than from the steer. These figures are very generally used by the boosters of the dairy and hog industry as evidence that the dairy cow or the pig is a very much more profitable animal than the steer or sheep. The amount of digestible nutrients required, however, to make a hundred pounds of gain is only one side of the question.

In all animals there is a very great difference in the proportion of feed which must be derived from concentrates as compared with the proportion which is derived from the roughages and pastures. For example, beef cattle, range horses, and range sheep can be and are raised very successfully and profitably without the use of any concentrates whatever. Even farm sheep will use but a very small amount of grain, deriving practically all of their sustenance from hay and pasture. This is very significant in view of the fact that one hundred pounds of digestible nutrients from grain will cost $1.50 to $2; from hay about 50 cents to 75 cents; and from pasture, 5 cents to 25 cents. The pig must derive as much as 75 to 90 per cent of his sustenance from the grains or concentrates. The dairy cow requires less concentrates than the hog, and on the other hand very much more than beef cattle and sheep.

Another very important factor in grazing countries is the extent to which these animals can utilize the pastures and ranges. For example, we find that horses, beef cattle, and sheep are sometimes run on range the year round, and derive their entire support from this source without the use of any other feed whatever. This is not the general custom, since they are usually given some feed for winter, but probably from two-thirds to three-fourths

of their sustenance even under these conditions is derived from the range. On the other hand, the range has no value for hogs or dairy cattle, and if the live-stock industry was confined to these two kinds of stock, all of the immense areas of range and pasture land would go unutilized. Both the dairy cattle and hogs can use some pasture, but it must be of exceptional quality, such as is produced on the tillable lands and not the scattering bunch-grass and sage-brush found upon the ranges.

The labor necessary in proportion to the gross income, or in proportion to the capital invested, is very small with horses and beef cattle as compared with dairy cattle, while sheep and hogs occupy an intermediate place. One man can take care of beef cattle to the value of perhaps $20,000, while $1000 invested in good grade dairy cows will give him all the work he can take care of. With sheep he could probably handle an investment of $3000 to $5000 and with hogs about the same.

The relative advantages and disadvantages of the various kinds of stock are also affected by their prolificacy and by their quickness of maturity. The time elapsing from the date at which the females are bred until the progeny are of marketable age is about as follows: hogs, 9 months; sheep, 12 months; beef cattle, 3 to 4 years; horses, 5 to 6 years. The offspring of 100 head of females of breeding age will average in twelve months as follows: Hogs (2 litters), 1000; hogs (1 litter), 500; sheep, 85; cattle, 70; horses, 50. This of course has much bearing on the relative investment in breeding-stock and the percentage of income from it. With horses the gross income on the investment in stock will be about 20 per cent per annum, while with hogs it will be about 700 per cent. All of these factors must be considered in

determining the ultimate advantages and disadvantages of these various kinds of live-stock. When the chief resource of the community is range, the industry must of necessity be either horses, beef cattle, or sheep, and cannot be dairy cattle or hogs. On the other hand, on cultivated ground where land is high priced and feed of extra quality, dairy cows and pigs will be more likely to return a satisfactory profit.

From the standpoint of the individual, the man who desires a profitable investment for any considerable amount of money will usually find a greater profit in range cattle or sheep. On the other hand, the man who has very limited capital and whose chief resource is his own labor, can invest this labor to much better advantage in some industry like dairying.

Some of these industries lend themselves to operation on a large scale while others must be limited. Beef cattle and sheep may be handled by the thousand, while very few dairies have proved profitable where there are more than forty or fifty cows. Hogs likewise cannot be kept on too large a scale. Hogs will consume many waste products and the chief profit in these animals is found to come from that source. While practically every farmer anywhere in the West can raise a few hogs at a profit, there are very few who have been able to make a financial success of raising hogs as an exclusive business, since under this plan they are obliged to allow a market value for all feed consumed, and cannot compete with the man who raises his hogs on feeds that would otherwise be wasted. Horses also are rarely raised on a large scale, but are more commonly produced on the farm where the mares do some work to help pay their keep. The farmers can in this way produce them at a low enough price to shut out the

man who attempts to raise horses more extensively and therefore keep a mare solely for the colt she produces. About the only stockmen who make an exclusive business of raising horses are those located in the range districts where winter feed is very scarce. Range horses will stand more hardship than any other class of stock and can be wintered out in the hills when cattle and sheep would starve. Horses raised in this manner, however, do not have the size and type to compete with farm-raised stock, and do not have much effect on the general horse market. While the horse can live under very hard conditions, the growing of good marketable stock requires plenty of good pasture, hay, and grain, the cost of which is partially offset by the work done by the mare. All of these considerations must be taken into account in selecting the kind of stock to raise. Old residents seldom make radical mistakes along this line, but newcomers often undertake to raise hogs where only a Merino sheep would live, or to raise beef where only a high-class dairy cow would return a profit.

PART II

BEEF CATTLE

By Ermine L. Potter

CHAPTER III

BEEF PRODUCERS OF THE WEST

BEEF cattle are found in considerable numbers in every state of the Union and in every country on the globe. In the United States they are most abundant in the Mississippi Valley and on the eastern slope of the Rocky Mountains. There are not as many cattle to a square mile in the West as in the central states, but more per capita of population, so that a very large proportion of the people of the West are concerned with the production of cattle. It must also be remembered that the West produces more cattle than it consumes and must market its surplus in the East. Both beef and dairy cattle are found in the West, but the former are far the more numerous. The dairy cattle are raised on the tillable farms while the beef cattle are on the ranges and big pastures. In this book we shall deal exclusively with the beef industry.

We will not burden our readers with a mass of figures as to beef production, since up-to-date statistics may be obtained from the census reports, the Monthly Crop Report, and from the Yearbooks of the United States Department of Agriculture. It should be noted, however, that the number of cattle declined materially from 1900 to 1910, until by the latter year there was a shortage of cattle. Prices had been low but with the shortage that developed prices went up. With better prices every effort was made to increase the beef herds, until at the present

time the ranges and pastures are fairly well restocked, although there is not yet (1916) any material increase in the number of fat cattle being marketed. A larger supply, however, does not seem very far in the future. There have always been periodical fluctuations in the supply and in the price of beef cattle and such changes must be regarded as fluctuations to be expected and not considered as permanent changes.

BEEF SECTIONS OF THE WEST

The raising of beef cattle may be divided into three phases: First, the production of the calf up to the time at which he is weaned from his mother; second, the growing of the steer from the time the calf is weaned until he is old enough and mature enough to fatten off for beef; third, the fattening of the steer. Many steers spend their entire lives up to the time of marketing on one farm, but this is far from universal. Localities differ in their adaptability to handling steers of the various ages, and consequently we find a tendency to devote some parts of the country to raising calves, others to growing the steers, and others to fattening them. Cows and calves demand a rather mild climate. They are, of course, handled in countries of very severe winters, but other things being equal, a mild winter climate is a very marked advantage. On the other hand, exceptionally good feed is not so important, whereas the growing steer demands above all an abundance of good grass. He can stand a severe winter and heavy storms. In fact, the loss with steers, unless they actually starve to death, is very small. A steer does not require any grain and only about a ton of hay for winter. The fattening of steers,

however, especially if the business is conducted in the winter time, requires a quantity of feed of exceptionally good quality. This means either plenty of good alfalfa hay or corn, or preferably both. The steer may be fattened on grass in the summer time, providing the grass is sufficiently good. On looking over the western country, we find that the southern part, including particularly Arizona, New Mexico, and western Texas, has a comparatively mild winter climate, and on that account is well suited to the handling of cows and calves, but on the other hand the grass is often poor and steers mature slowly. The eastern slope of the Rocky Mountains, particularly the eastern parts of Colorado, Wyoming, and Montana and the western parts of Kansas, Nebraska, and the Dakotas, is a region of much better grass than the Arizona and New Mexico country, but on the other hand subject to much more severe storms. The growing steer, such as the yearling and the two-year-old, does better in this region than farther south. Sometimes the grass is sufficiently good in the summer that the steers may be shipped directly from the range to the slaughtering centers, but often it is necessary to put them through some definite fattening process. This region does not produce very good fattening feeds; consequently the industry of fattening steers is centered largely in the states farther east, that is, in the Corn-Belt. The southern part of the West, *i.e.*, Arizona, New Mexico, and western Texas, is largely devoted to the raising of calves, which are sold at an age of about twelve months to the cattle-men farther north, along the eastern slope of the Rocky Mountains. These men keep the cattle for one or two more years, and if they become fat in that time they are sent directly to the markets on the Missouri River or at Chicago, or in

case they are not fat they go to the feeders in the Corn-Belt, and there, after three to six months, they are sent to the big markets. Not all of the cattle, however, are transferred in this manner, and as stated before, many are born, grown, and finished on the same farm. Especially is this true of Idaho, Washington, Oregon, and California. This region is more varied in its agricultural and grazing conditions, and the tendency is much greater to raise and finish the steer on the same farm. Another factor is that the western markets handle much of the beef produced in these states, which means that the cattle cannot very well be shipped to the Corn-Belt for finishing, but this must be accomplished somewhere in the Northwest. In the northwestern country such immense areas of land of approximately uniform nature are not commonly found; on the other hand, however, the summer range, spring and fall ranges, winter ranges, and alfalfa are found well mixed together, often all within a very few miles. Hence, the Northwest is not only adapted to the grazing, growing, and finishing of the steer on the same farm, but is especially adapted to the small stockman, handling from 50 up to 400 or 500 head, and is much less adapted to the big outfit, running cattle by the thousands.

RANGE CATTLE

The range cattle-man's business varies slightly in different parts of the West, but generally speaking, his equipment and operation will be about as follows: He will own a considerable tract of land, usually scattered over a large area, so as to cover most of the available water and all of the hay land. If he has land sufficient to raise a large amount of hay and to cover a number of streams

and springs, he can in this way control the use of a large area of outside range for which he has no legal title. In addition to controlling a large tract of government land, the cattle-man may run some of his stock on the Forest Reserves in the summer. In the case of much of the open range, however, no one stockman has complete control; but instead, cattle belonging to a number of persons will be found running together. This is true of nearly all of the government land, whether unappropriated or Forest Reserve.

The system of management is comparatively simple. During the summer the cattle are run on the range, mainly in the higher and more inaccessible districts. Wherever possible, the cattle are worked from the lower to the higher altitudes as summer approaches, so that by June or July they are on the high mountain pasture where the grass is green in midsummer but where the grazing season is very short. As fall comes the cattle are moved down to lower altitudes where the season is longer and where in some cases the cattle may graze all winter. They are given little care except occasionally to give them salt and to see that they do not stray too far away. One man will look after several hundred cattle. Practically no attempt is made in the way of herding. In some cases there is a little line riding; that is, guarding a certain line to prevent the cattle from going into some district where they are not wanted, or perhaps to keep them from straying into the Forest Reserve when no permit has been granted. In the fall of the year the cattle are rounded up; that is, the entire district is carefully ridden over, all the cattle gathered together at one or more central points. At this time those that are to be sold are separated and sent to market. Sometimes the cattle are rounded up in

a certain district two or three times during the fall; in other cases, there will only be one round-up at this season. It is usually necessary for several men to get together in order to collect their cattle. When the round-up is over, the cattle which are not to be sold or taken into some other range or pasture are turned loose again. The round-up also gives opportunity for each man to separate his cattle from the others and for branding the calves. When winter comes, the cattle are worked down on to the lower lands where there will perhaps be some bunch-grass saved up for fall and winter range, or they may be put on the meadows after the hay has been cut. On the government land it is practically impossible to save any grass for winter use, but a little may be saved on the land which belongs to the stockman and which is under fence. This grass which has grown up in the summer and died down in the fall makes an excellent feed when abundant, and when the snow is not too deep provides a good and economical method of wintering cattle. The inability of cattle-men to control the range, however, usually makes it difficult to save any considerable amount of grass for winter use, and thus the stockman is obliged to feed a large amount of hay, even when there is little snow on the ground. The feeding of hay is put off until as late in the winter as possible, since the cattle will not rustle for grass to any advantage after they have once had a taste of hay. The amount of hay used, in any case, is comparatively small. One ton a head is the usual allowance. Most of the hay used is wild hay, grain hay, or alfalfa. When spring comes the calves are branded and the cattle turned out on the lower ranges. The steers are ordinarily kept until they are three years old, although some stockmen who have sufficient hay for fall pasture to fatten them in the

winter will sell them off as "twos." The range-men, however, do not undertake a great amount of winter fattening.

The age and weight of cattle marketed depend a great deal on whether they are marketed for feeders or for beef. The cattle marketed in the fall for winter-feeding purposes range in weight from 900 to 1100 pounds, with much the larger number coming between 950 and 1050. The cattle that are fat enough for beef usually weigh between 1000 and 1300, with the larger portion between 1100 and 1200. The ages at which cattle become fat enough for beef and reach a weight of 1100 to 1200 will depend on the system of feeding. The cattle marketed as feeders are commonly two-year-olds, although some calves and yearlings go to the Corn-Belt for feeding purposes. The cattle marketed for beef are sometimes twos but more commonly threes. Many statements are heard to-day to the effect that the day of the three-year-old is past and that the two-year-old cannot last long. Such statements should not be taken too literally as applied to the western country. There are enormous districts which have plenty of grass of a low grade, but only a limited amount of hay and no grain. Such a country cannot produce a fat yearling at a profit, but in order to utilize their feed and grass properly must keep the steer until he is two or three years old. The price of cattle also influences early maturity. When cattle are high, the producers can afford to feed them large amounts of hay and even grain, but when prices are low producers are compelled to use only feeds which have no other value, and this means the bunch-grass on the range. Under strictly open range conditions with only hay enough for wintering, steers at an age of about

thirty months will rarely weigh 1000 pounds or be fat enough for beef, and hence must either be taken to some other country or carried over another year. Of course more hay would make the steer larger but most of the range districts are already raising all the hay they can and feeding it all. The very same country, however, when put under fence, will produce enough feed to cause the larger part of the two-year-olds to become fat and to weigh over 1000 pounds. On the open range, even where grass is very abundant, the cattle will remain all the season where they were first turned out and eat the grass into the ground, although there may be fine feed a mile or two away. They may be driven on to the good grass but unless held there by a fence will soon return to the bare ground and half starve rather than change their habits. Cattle, to do well, should be put into new pastures at least two or three times during the season. When this is done and some care is given to the grass, the steers will mature approximately one year earlier and be better cattle, but even this is far from yearling beef or baby beef.

The reader should bear in mind that in indicating the ages of cattle, an animal born in the spring of the year is called a calf until the following spring, at which time he is called a yearling. Beginning with the second spring, he is called a two-year-old. Calves dropped in the late fall and winter are grouped with calves dropped the following spring except that they are designated as "early" calves. They are called calves until the second spring when they are called "long" yearlings. Along in the winter these early calves will still be called "early" calves, although they are actually past twelve months of age. A year later they will be called "long yearlings," although

they are actually past twenty-four months. Late calves, that is, those born in the summer, are classed with those dropped that spring, but their late birth is indicated by calling them "late" calves or "short" two-year-olds or "short" three-year-olds as the case may be. A "short" two is not necessarily less than two years old, but is an animal born late in the season, that is, well along into the summer, while a "long" two is not necessarily more than two years old, but is a calf born very early, actually in the late fall or in the winter.

The Hereford and the Shorthorn are the most common breeds and practically all of the cattle of the West carry a considerable percentage of the blood of one or both of these breeds. A few Angus and Galloway bulls are used, but not many. Generally speaking, the beef cattle of the West are well bred, although there is still some evidence of unimproved blood and in many places dairy blood has been allowed to creep in. In Arizona, New Mexico, and all the region east of the Rockies, the Hereford is by far the popular breed. In the other western states, however, the Shorthorn is very strong and in California, Oregon, Washington, and Idaho is fully able to hold its own with the Hereford. In a general way the quality of western cattle improves as one goes north from Mexico to Canada. Feed conditions also improve going north and some of the better quality of cattle may be due to better feed, but some of it must be attributed to better breeding. In the past few years, since cattle have been sufficiently high priced to justify the expense, the rangemen have been using many very high-class pure-bred bulls, costing from $100 to $250 for bulls old enough for service. In some states, as Oregon and Idaho, laws have been passed prohibiting anyone from turning on the public

ranges any but pure-bred bulls of some recognized beef breed. The use of these good bulls has proven very profitable and to-day steers of good breeding, that is, carrying several crosses of Hereford or Shorthorn blood, are selling for $10 to $30 a head more than unimproved stock even when the feed has been the same.

While there are many very large and very wealthy cattle outfits in the West, particularly farther south, the business is very largely in the hands of small cattle-men running from 100 to 500 cattle and having invested a capital of $10,000 to $50,000. While these men handle large numbers of stock and own or control hundreds of acres of land, the capital invested and the annual proceeds are not so far different from the capital and income of the general farms of the irrigated sections or of the Corn-Belt. The profits of the business are very hard to estimate. Most of the ranch-men have been in the business for many years and have accumulated considerable property, both in cattle and land. The land was in most cases obtained for little or nothing and the cattle were raised at little expense. The business was accomplished by much risk and considerable hardship, but on the whole those who have followed it for a number of years have been successful. At the present time, these men value their real estate rather high, and this, combined with the large amount of hay required in the winter time, makes the expense very heavy. Few of these men are now making more than a moderate rate of interest on the value which they give their holdings. The situation is also complicated by the rapid deterioration of the range. Much land which formerly produced a large amount of grass now produces practically nothing, and in many places sage-brush and weeds have almost completely taken the place of grass. This

is making the cost of wintering higher and higher, and also tending to deteriorate the quality of beef. Nevertheless, the man who has a fairly good free range and plenty of land for raising hay, is making very good money. His great drawback is his inability to obtain legal title to the range which he uses. If there were some system whereby he might homestead or purchase this land, he would then cut down the amount of stock and give the land a chance to develop instead of killing it out by overstocking. Under the present conditions, however, there is no incentive for the stockman to protect his range, since the grass which he might save for his own use would be eaten up by someone else's cattle or sheep. Of course the process of fencing the range has not been an unmixed benefit. Range-men have been willing to pay a large price for a little fenced land which they could hold in reserve for emergency, or for land which would give control to a larger amount of outside range. This has tended to establish prices for grass land far in excess of its actual productive value. Then as the country develops and the free range disappears, the cattle-man finds himself confined to his own land with an investment so high that he cannot pay the interest. Bunch-grass land is of course very variable in its value, but at best it will pay interest on but a nominal price. This is shown in the following statement of the cost of running cows under typical conditions in the Northwest, from October to October:

Interest on $45.00 cows at 8%	$3.60
Annual loss of cows 3% (of $45)	1.35
Cost of one ton of hay in the stack	6.00
Cost of feeding one ton of hay	1.00
Riding and salt	1.00
Interest and depreciation on bulls	1.00
Total without grazing	$13.95

Value of calf in October	$25.00
Per cent calves at weaning	66⅔%
Value of calves per cow (66⅔% of $25)	16.67
Margin for interest and taxes or rental on grazing land	2.72

On a typical cattle ranch of the better class of the Northwest, such as are now being put under fence, each cow will require ten acres of extra good bunch-grass for spring and fall and fifteen acres of mountain grass for summer or a total of not less than twenty-five acres of grazing land for each cow in the best localities and two to four times this amount on the poorer lands. Of course the cost figures vary somewhat from those given above, but not very much. Under strictly free range conditions the percentage of loss is greater than the 3 per cent indicated and the percentage of calves at weaning somewhat less. On the other hand, with good fencing and careful management, the loss can be cut to 2 per cent and the percentage of calves raised to 75 or even 85 or 90 per cent. Only from a herd of carefully selected cows in the hands of a very skillful and painstaking owner can 85 or 90 per cent calves be obtained.

The annual cost of running calves and yearlings and two-year-olds is about the same as that of running breeding cows. With calves, the investment and the hay are less, but they require more care and the loss is much heavier. With yearlings and twos, the expense items do not differ much from those with cows. About the only item in which cows cost more than steers is in the interest and depreciation on the bulls. The annual income is also about the same. At the present time in the Northwest the October prices on steers are about as follows: calves, $25; yearlings, $40; twos, $55; thus making an annual increase in value of about $15. Investigations into the

cost of producing cattle conducted by the writer for the Cattle and Horse Raisers' Association of Oregon indicate that with present (1916) prices the average cattle-man of the Northwest will have left as income from the grass land after he pays interest on his cattle, on one ton of hay to a head and other incidentals, not to exceed $2.50 a head. Therefore, the man who invests in range land should figure that land enough for a cow will produce not over $2.50 per annum.

The reason that the present ranges are devoted to cattle rather than to some other form of agriculture, is because the land is too rough to be used for anything but cattle, sheep, or horses, and the competition of the farmer horse-breeder has largely done away with the range horse-men. The range is still rather evenly divided between cattle and sheep. The chief reason for raising cattle in preference to sheep is the absence of high mountain pastures where the grass will be green throughout the summer. This green grass is necessary for the ewes and their lambs, but the cattle can thrive in the drier sections. The high mountains of the Forest Reserves are especially suitable to sheep, and would be almost exclusively devoted to that industry were it not for the policy of the forest officials, who prefer cattle to sheep on account of the less damage done to young trees. The Forest Supervisor often refuses to allow cattle-men to run sheep in place of cattle, but will readily grant permission to make opposite change. These are the most important factors, although in many cases the large amount of work and worry connected with the sheep business leads the stockman to take up cattle instead; while personal preference is another factor.

FARMER BREEDERS

Many of the more well-to-do and ambitious grain and hay farmers in the irrigated valleys raise a few cattle in connection with their farming operations. The cattle will be run on the ranges or bunch-grass pastures during the summer. Very few are pastured in midsummer on the irrigated lands. In the fall they are brought in from the ranges and allowed to clean up the stubble fields, which in this semi-arid climate have a good feeding value. They are also allowed to graze meadows after the hay is off. In many of the hay districts the last crop of alfalfa or clover and timothy may make excellent pasture, even though not quite good enough to cut for hay. During the winter the cattle are still allowed the run of the fields and in addition have access to the straw stacks. In some cases they have no feed other than the straw, but on the larger number of ranches some hay is given during the winter, particularly in the latter part of the winter and early spring. As soon as the grass is good on the hills, the cattle are again turned out and the farmer pays little attention to them during the summer, devoting almost his entire time to his farming operations. In some cases the farmer may own range and have it fenced. In other cases he may lease range, and in still others, several farmer breeders may go together and hire someone to look after the cattle out on the open range or Forest Reserve. While there are very few large herds handled in this manner, there are many small ones, so that the total number of cattle raised by these breeders is considerable. The quality of cattle raised in this way is above the average, and many very fine steers are bred by this class of stockmen. Where the summer grazing is not too expensive,

the profits are apparently large, since the cattle utilize the stubble fields, straw stacks, and other material which would otherwise be wasted, but the number which can be kept on any farm is limited, usually from twenty-five to one hundred. These farmers raise cattle rather than sheep mainly because of the less care and work required. Since cattle are handled almost entirely as a side issue, the owners do not care to devote much labor or expense to the industry. If sheep were raised, it would be necessary to have a herder throughout the year, and this in turn would necessitate a flock of perhaps 2000, a larger number than most of the small farmers could accommodate. Another factor is that the cattle seem to make better use of the straw than do sheep.

FEEDERS

When we speak of "fattening steers," we refer to finishing steers on heavy feed after they have grown to a fair degree of maturity on range or pasture. When a steer weighs about 1000 or 1100 pounds, he is sufficiently developed that there will be little profit in attempting to grow him to a much greater size. The older a steer becomes, the slower the growth, and the larger the amount of feed consumed. Consequently the cost of each pound of growth increases very rapidly, and at about the weights given (1000 or 1100 pounds) it ceases to be profitable to proceed any further. A large number of cattle coming in from the range at 1000 or 1100 pounds, however, are not sufficiently fat to sell for beef at satisfactory prices and so require to be put on full feed and fattened as rapidly as possible.

When steers become fat on the range and are sold di-

rectly to the butcher or packer, we seldom speak of a separate process of fattening; but when these range steers are taken to the farms, put into feed lots, and kept on full feed for a few months, we speak of "fattening" them, and the men who carry on this business are called "feeders." In some localities the business is carried on primarily with the idea of fattening cattle, which would otherwise be in unsalable condition. More commonly, however, it is conducted with the idea of marketing surplus feeds. The larger part of the feeding takes place in the Corn-Belt, but a considerable amount is done in the irrigated portions of the West. Since the feed used in the West is almost always alfalfa, the feeder is usually a farmer who grows a quantity of alfalfa for which he must find some market, hence he buys steers in the fall and fattens them during the winter and sells them when fat. Many of these feeders buy all the steers they feed and do not raise any cattle at all. Such feeders may have no pasture land or range. The fattening of cattle is usually confined to the larger irrigated valleys which produce a surplus of alfalfa which is not needed for wintering stock or for shipment to the cities. The details of the feeding business will be taken up in Chapter V.

CHAPTER IV

THE BREEDING HERD

SINCE beef cattle are usually run on pasture or range until ready to go into the feed lot, with only a little hay for winter and no grain, the problems of beef raising resolve themselves very largely into problems of care and management. It is commonly said that beef cattle are "fed" but very little, meaning of course that little hay or grain is given, and the animals instead are allowed to depend largely on pasture or range for their living. The popular press criticizes the cattle-men for these practices, and is fond of telling how much better cattle could be produced by the proper use of more hay and grain. This is all true, but the problem of producing better cattle is secondary to the problem of producing them cheaper so as to leave a greater profit for the man who raises them. With dairy cattle and hogs, the best feeding is nearly always the cheapest. The feeder who obtains the best gains with these animals finds that economy largely takes care of itself. With beef cattle, however, the case is entirely different. They consume more feed for what they produce than any other kind of live-stock. The only reason that beef is not very much more expensive than other kinds of meat is the fact that cattle can and do consume feeds which have little or no value for other kinds of stock and that they require the minimum amount of labor and attention. A beef steer requires as much food

as a dairy cow and yields about one-third the income. To put him in the stable and feed him in the same manner as a dairy cow would be an economic impossibility, although the finest kind of beef might be produced in this way. The beef steer cannot compete with the dairy cow or the pig for feeds which these animals can use.

BULLS

Like nearly all male animals, bulls will last longer, have a larger percentage of calves, and handle a larger number of cows when they are not allowed to run with the cows at will, but are kept up and the cows brought to them when they come in heat. In spite of these facts, however, where beef is raised on a large scale it seems absolutely necessary that the bulls be allowed to run with the cows. The bad results arising from this practice can be and are largely overcome by providing more bulls and by using only mature or fairly mature bulls. In many places there is such an indiscriminate mixing of the herds that the owners do not know whether their calves are from their own bulls or from their neighbor's bulls, or even from some maverick that has escaped castration. Under these conditions there is little incentive toward the use of good sires. The range-man should, therefore, see that his cattle are so managed that his cows, and his cows only, are served with his bull. This may be accomplished in three ways: coöperation, line riding, and fencing, or perhaps by all of these together. Since the range-man seldom owns all of the land upon which he runs his cattle, fencing cannot be generally practiced, and even when he does own his range, the land may be so poor that the task of fencing enough off to make grazing possible for his

herd would be expensive. This, however, is rarely the case, since the cost of fencing cattle pastures is only from fifty cents to $1.00 an acre and if the whole country is fenced the neighbors pay half of this. The range countries are usually divided into sections of various size by streams, mountains, and other topographical features, so that cattle in one section will not stray into another. In other cases these divisions are not complete but are nearly so; hence a little herding at the mouth of the gulch or a few rods of fencing may complete the division. The natural divisions vary in size from small valleys capable of supporting a few milk cows to vast prairies comprising many counties. A single one of these districts is usually spoken of as "a range." If the ranchman has control of one of these natural divisions of about the proper size for his herd, be it large or small, he is fortunate; but this state of affairs seldom exists, and as a result several men may be obliged to run their cattle together unless separated by fencing or line riding. By line riding is meant keeping the herd in their proper territory by having riders guard the imaginary line between ranges. Each man is given so much of the line to ride over each day. Along well-defined trails it may be necessary to have a man for only a mile or two, while in other places where the cattle are not inclined to stray, one man may be given all that he can ride over two or three times a week. The natural divisions of the ranges are always taken advantage of, so it seldom is necessary to ride more than a fraction of the boundaries of the range. Line riding is expensive but many cattle-men find that the advantage of having their stock to themselves more than pays for it, although fencing is much to be preferred and is being used wherever possible.

When all of the men running cattle in the same territory are progressive and on peaceable terms, they may combine and agree to use only bulls of a certain grade. This plan is hardly as successful as when each man has his cattle to himself, but is much better than running the cattle together without any coöperation. It also tends to lessen another great evil of the open range — the practice of some stockmen to run too many cows in proportion to their number of bulls, and depend on the service of their neighbors' bulls. These coöperative associations usually require one bull with a certain number of cows, the number being usually one to twenty-five.

No bull is too good to use on scrub cows, and there is no danger of paying too much for a bull, so long as one is paying for real beef-producing merit and not for popular blood lines or fancy points which have no great value beyond the limits of the pure-bred trade, but which are often the basis of the extraordinary prices that are sometimes paid. Figuring one bull to twenty-five cows, $100 added to the price of a common bull will accomplish more toward improving the calf crop than $4 a head added to the price of common cows. There will be a marked difference between the progeny of a $150 bull and of a $50 bull, while the calves from $49 cows will be but a very slight improvement over those from $45 cows. From the calf standpoint, the money invested in the bull goes about twenty-five times farther than when invested in the cows. It often happens that fine beef bulls are off type in some fancy point of the breed, or are of an unpopular family. Such bulls can be purchased cheaply, and should be watched for by the man who is breeding grades for the beef market. Then again, good bulls of mature age are often sold because their calves are coming into breeding

age; these, too, may be bought cheaply and are often more useful than a young bull would be, but this refers only to bulls from the small farms and from registered herds. Discarded range bulls are usually worthless for breeding purposes. They are too often sold because they have lost their breeding powers through too much service or general hard conditions. Good bulls may be purchased from almost any of the breeders of good pure-bred cattle in the West. Some of the bulls are marketed direct from the farm and some through the public auction sales. The names of the leading breeders may be obtained from the advertising columns of the agricultural papers or by writing to the state agricultural college. Most of the agricultural colleges keep in close touch with the breeders and can give at any time the nearest and best place to buy bulls.

Under farm conditions, a yearling bull should sire about twenty calves; a two-year-old bull, thirty; and a three-year-old, forty. Under range conditions not more than half of this number can be expected. A yearling is not very satisfactory on the open unfenced range, since hard conditions and too many cows not only cause him to get very few calves that year but may render him useless thereafter. The best cattle-men use only mature bulls and put one with twenty or thirty cows.

The price commonly paid for beef bulls ranges from $100 up to $250. It is practically impossible to buy a good bull of any kind for less than $100, and the better grades cost from $150 to $200. This is for good, well-bred, registered animals of breeding age. Calves cost somewhat less. A fancy grade of bulls, such as are suitable to head good pure-bred herds, cannot be bought for these prices, but will cost $400, $500 and up to $5000 each. A few years

ago there was much complaint that the range-men were trying to buy their bulls too cheaply. Cattle were low and feed expensive, and the range-men felt unable to pay $150 or $200 for a bull when cattle were at the price they were then receiving, and in the meantime the breeder of pure-breds was not getting for his stock what it cost to raise them; within the last few years, however, since beef has been a good price, there is little complaint from that source, and the range-men are now willing and able to pay good prices for bulls.

COWS AND CALVES

The well-known veterinary authority, Fleming, estimates that the average breeding efficiency of cattle is about 78 per cent. By this is meant that with 100 cows of breeding age, we should expect 78 calves per annum. The carefully managed herd will do somewhat better than this, and will sometimes go as high as 85 per cent or 90 per cent. On the other hand, however, the average herd on the open range will not do so well, the average being about 60 per cent, although with good care and good bulls an average of 65 per cent to 70 per cent is obtainable. This percentage largely determines the cost of the calf. At the present time a good range calf is worth about $25. If the cost of caring for a cow a year is assumed at $15, it will be noted that if it is necessary to maintain two cows to get one calf, there will be an annual loss of $5 on each calf, but if four calves can be raised from five cows a good profit will be allowed. There is perhaps no other phase of the beef-cattle industry wherein so much improvement can be effected by careful management, with the minimum additional investment in the way of capital.

The first point to be considered is that there should never be too many cows to one bull, and that the bull is strong, vigorous and fertile. Some range-men test their bulls each year by breeding to a few named cows in pasture. The other important factor is the elimination of the non-breeding, or shy-breeding, cows. In the beef herd there is but one course to take with a cow that comes from the range in the fall without a calf; namely, to send her to the butcher. Usually if she brings no calf she will be fat, and if she is not she should be given a few weeks in the feed-lot. About January one can often tell what cows are not going to bring calves in the spring, and it is not then too late to put them in the feed-lot and turn them for beef at a profit rather than to carry them another year. Such a practice will have a great influence in increasing the percentage of calves. When a shy-breeder does have a calf, that calf will not be so valuable to keep in the herd because of the tendency toward irregular breeding that is likely to be transmitted. It is generally admitted by those who have studied the matter, that the two most common faults among all of our stock, and at the same time the two most damaging, are lack of constitution and low fertility. Not absolute barrenness, but breeding part of the time, is more dangerous; the former ends itself, but the latter is self-perpetuating.

The time of the year when calves should come varies with the feed and the climate, but it should ordinarily be as early in the spring as the cow can take care of the calf. Where hay is abundant, the calf may come some little time before grass is good. The additional growth of the calf will pay for the extra care, since he obtains so much more good out of the succulent summer grass and goes into the winter quarters strong and vigorous. Late

July and August calves are to be avoided. If weaned with the others, they are too young and will not thrive, while if allowed to run with the cow on winter feed neither the cow nor the calf does well unless more hay is fed than the calf is worth. A July calf will not usually be any larger at two years of age than one dropped the following March. Fall calves are satisfactory in the dairy herd or the show herd but on the range they usually are expensive and unsatisfactory. An exception, however, must be made in the case of the stockman who has unusually good shelter and a great abundance of good alfalfa. It has been demonstrated that under these conditions the cow and calf may be given a well-bedded shed and a ton and a half of alfalfa and produce an excellent calf. When spring comes the cow goes out on grass, and the calf, instead of being weaned at six months of age, gets more milk than ever and is so allowed to suck the cow for nine or ten months. Such a calf at twelve months is as big as the spring calf at eighteen months. These methods mark the most advanced stages of beef production under western conditions; however, only a few cattle-men have facilities for handling this class of cattle, and but few are willing to give them the necessary attention.

The length of the period of pregnancy (the time between breeding and calving) is nine months; hence for spring calves the cow should be bred in early summer. The cow comes in heat at intervals of about eighteen to twenty-one days throughout the year except for two or three months after calving, and remains in heat for about twelve hours. When the bull is not allowed to remain with the cows, care must be taken to watch the cows carefully every day when it is desired to breed them, else the period of heat will pass by without being noticed

and thus three weeks' unnecessary delay in the time of breeding and calving. Heifers should be bred to calve at about three years of age, unless they are especially well fed, when they may calve at two years. They come in heat first at six to twelve months of age, and if allowed to run with the bull will calve too early. Heifers should, therefore, be kept in a separate herd from weaning until ready to breed.

WEANING

Spring calves should be weaned some time the next fall. There need be no hurry so long as the grass is good; in fact, it is best not to wean until the feed in the pasture is gone. Weaning should not be deferred after the cows are on winter feed. A pasture at some distance from where the cows are kept is a good place to wean calves, but the fences must be practically hog tight, not only where the calves are but also where the cows are kept. Such pastures are seldom found on ranches where cattle is the leading industry. The method is to shut the calves up in a tight corral and feed them all the hay they want during the winter. Such a corral should be on rather dry ground, and provided with good watering facilities and a dry well-bedded shed besides the necessary racks. Refuse or damaged hay may be fed, but it usually pays to feed rather heavily of good clover or alfalfa all winter. Timothy is expensive and not the best feed for calves or any other kind of cattle. Wild hays are not as good as the legumes, although some of the upland hays are very nutritious. Slough grass and tules are poor feed. Of course there are cattle sections where timothy or wild hay must be used, as there is nothing else available. In such places it is necessary to feed it, but as good results

cannot be expected as on alfalfa. The calves, when isolated in a corral, will be weaned before the winter is over, but should be left in the feed-lot until the grass comes. If the number is large enough to divide, the heifers and steers may be separated, and the steer calves fed the larger and better rations. There is little danger that steers will not pay for all the hay they will eat the first winter, but heifers must be handled with more economy. When fall calves are raised, they need not be weaned until about ten months old. This long sucking period is the advantage of the fall calf besides the fact that he can be weaned on pasture instead of dry hay.

CASTRATION

Castration is usually performed somewhere between the ages of one and five months. Generally speaking, the earlier the better after the calves are strong and vigorous. After the age of five months, the sexual characters begin to develop and the animal will have a staggy appearance. The better the calves are fed, the earlier they must be castrated to avoid all danger of stagginess. Castration of calves is performed by two methods; cutting vertical slits in the front of the bag or scrotum to take out the testicles or cutting off the entire lower end of the scrotum. Some buyers of steers judge the condition of the animal by the size and filling of the "cod" or "purse" (the scrotum after the testicles are removed). Many cattle-men, therefore, object to cutting off the end of the scrotum, since it makes the cod appear smaller. But others prefer this method since it guarantees perfect drainage of the wound and easy healing. In the other method, perfect drainage may be obtained by taking

care that the slits extend well to the bottom of the scrotum, but careless operators will often leave a pocket that will gather pus and cause infection of the wound. In making the vertical incision, the skin is held tightly over the testicle and the testicle pops out the instant the incision is long enough to permit it. This leaves an incision that often does not reach to the end of the scrotum and which in any case is so small that the wound will heal on the outside before it does on the inside. For these reasons, it is necessary to enlarge the openings after the testicles have been removed, a precaution which careless operators will not take. Thus many cattle-men require the operator to take off the entire end of the sack, and since but few buyers now pay any attention to the filling of the cod, it would seem best to follow this as the easiest and most sanitary method.

After the scrotum is opened, the testicle will be found inclosed in a membranous covering. This is slit open, and the testicle squeezed out. The membranes are also cut from around the cord, so that there is nothing holding the testicle but the soft vascular cord. This is then pulled out as far as possible and scraped in two with the knife. Some good disinfectant is used to wash off the scrotum before the operation and to apply to the wound when finished. The best operators will sometimes lose a calf, but most of the losses are due to failure to use disinfectants or to open the wound so the pus can escape and so that there is no danger of the outside healing before the inside.

WINTERING

Winter feeds in different communities vary so widely that few rules for wintering can govern all cases. Dry

pastures, stubble fields, straw, and hay are the feeds used. Of these, hay is far the most important. When hay feeding is begun, it must last until grass comes again, since cattle that have had a taste of hay will stand around and bawl for more even though they have other feed. For this reason, it may be wise to let the herd suffer a little during the early storms rather than to begin on hay and have to keep it up until spring, even though there may be plenty of other feed as soon as the storm is over. The amount of hay that can be profitably fed to wintering cattle depends on whether they are steers, heifers, or cows. Steer calves, as already mentioned, will pay for all the hay they will eat, providing it is not too high in price, say $4.50 or $5.00. Yearling steers will not pay for as much feed as calves, but for more than heifers, and heifers for more than cows. One usually expects cows and heifers to lose some fat during the winter. It is not always profitable to try to keep them in the same flesh they were in in the fall, provided they are fat at that time. If they come off grass in a thin condition, it will be necessary to feed rather heavily to keep them up. It is essential, therefore, that cows should go into the winter in good condition, since winter feed is very expensive as compared with summer grass. One ton of hay for a cow during the winter as a supplement to old grass or straw is the standard allowance, and a country where it is necessary to feed more than this is badly handicapped for beef-raising. Heifers perhaps stand a little more feeding than the cows, but not much. They must be kept in a good thrifty condition and that is about all that is necessary. They will not grow very much during the winter, but will make a good gain during the summer. Yearling steers, as compared to heifers, should have a little more

care, but it will not always pay to give them a full hay ration all winter. Even on light feed every pound of gain put on in winter will cost more than it will sell for, but stock cattle are usually worth more a pound in the spring than in the fall, because they have been carried over this expensive period and are now ready to make cheap gains on grass. Thus it is seldom advisable to attempt to make large gains in beef cattle during this expensive period, unless the price of cattle is high enough to warrant producing extra large gains at a high cost. Even then the pasture should be good, since cattle will not make as heavy gains when turned from extra good winter feed to poor pasture as if they had been fed more lightly during the winter. If the pasture is very fine, however, the cattle will gain well, even though they have had extra good feed all winter. This does not mean that one must allow these cattle to become poor during winter, but it does mean that economy must always be kept in mind.

Two-year-old steers should usually not be wintered but should be put in the feed-lot and finished for market in case they are not fat enough for beef in the fall. Much of our cattle country has reached a stage where it does not pay to keep three-year-olds. The judicious but not excessive use of hay during the winter, especially for calves, and care during the grazing seaon will easily enable the ranch-man to produce "twos" that will come in in the fall weighing around 1000, which is about as large as the common run of "threes," raised by the old method.

As a guide to the amount of feed required for wintering cattle, it may be stated that a 1000-pound steer or cow will require seventeen or eighteen pounds of good hay each day for maintenance. This means merely to maintain the weight without either gain or loss. The estimate is

based on the use of hay alone, without the addition of any other feed, such as straw, stubble fields, or grass. On this basis one ton of hay would maintain the animal for just about 120 days, or four months. When there is other feed to supplement the hay, or when it is not necessary to feed as long as 120 days, somewhat less than one ton of hay may be used. On the other hand, if it is necessary to maintain the cattle on hay alone for longer than four months, or when it is desired to make some gain in weight, more than this amount of feed will be needed. The amount of hay which can profitably be used for wintering cattle will always be subject to question, since it varies with so many other factors, especially with the price of cattle. With cattle worth 7 or 8 cents a pound and hay $5.00 a ton in the stack, it is hard to feed too much, but with hay at $6.00 or $7.00 and cattle worth 4 or 5 cents it is a different proposition, and beef production under such prices is possible only by the most rigid economy and hay can hardly be cheap enough to justify its unlimited use with low-priced beef. The kind of hay used will on most ranches be the kind available. When cattle are wintered in the larger irrigated valleys some selection is possible, in which case alfalfa practically always proves the best feed and can be bought at the lowest price. Plenty of good alfalfa produces a quality of cattle that can hardly be duplicated without this feed. In many range districts, however, it is a problem to procure hay of any kind. On the marshy sinks such as are found throughout the Great Basin region, wild hays are grown. These range from timothy or clover to tules, with a corresponding variation in feeding value. In the high dry parts of the country farther north, rye is about all that can be grown and this

crop has saved many a cow from starvation and made cattle-raising possible where otherwise there would be only the jack-rabbit. Toward the Mexican line the sorghums play much the same part as rye farther north. The quality of the hay makes much less difference in wintering stock cattle than in fattening steers, and the hay that a fattening steer would not touch will pull a thin cow through the winter in good condition.

CHAPTER V

FATTENING STEERS

PRACTICALLY no corn is grown in the West, hence the cattle are fattened on alfalfa or other hay. We include, however, in this chapter a discussion of fattening cattle on corn, since many of the cattle raised in the West eventually find their way into the Corn-Belt feed-lots, and since the supply of corn-fed steers largely controls the price of cattle in the big markets.

FATTENING ON CORN

In the central states the fattening of steers is accomplished almost exclusively on corn supplemented with a little hay. The corn is fed in various forms, as ground, shelled, or soaked, but most commonly on the ear. Feeding on the ear is cheaper than most methods and produces good gains. The amount of corn fed each day will vary from fifteen to twenty-five pounds of shelled corn or twenty to thirty pounds of ear corn. It is generally estimated by farmers that a good healthy steer will eat one-half bushel each day, but it takes a very large steer actually to consume this amount. One bushel of shelled corn weighs fifty-six pounds, while one bushel of ear corn is ordinarily estimated to weigh seventy pounds. A "bushel" of ear corn is the amount of ear corn which would

produce one bushel of shelled corn, and would, therefore, much more than fill a bushel basket. Steers getting all the corn they want will eat but little hay, not over seven or eight pounds a head after they are on full feed. Most of the feeders in the Corn-Belt pay little attention to the kind of roughage, although it has been conclusively proven that the use of legume hay, such as clover or alfalfa, will cause the steers to gain faster at much less cost. The steers will not only eat more hay, but will at the same time eat as much or more grain. In all cases it is the intention to give the steers all they will eat of both hay and grain, except for the first few weeks. Steers not used to heavy feeding can be allowed only a small amount of grain or they will gorge themselves and go off feed. This makes it necessary to begin with a small amount, three or four pounds daily, and gradually increase until they are eating all they will clean up twice a day. This increase is usually at the rate of about one-half pound a day, although some feeders increase the rations one pound a day for a few days, and then do not increase them at all for several days more. It thus takes from a month to six weeks to get the animal on full feed. This process of "getting on feed" applies only to grain. Steers may be given all the hay they will eat from the start, even if turned in the feed-lot very hungry. The steers fed in the central states are largely twos and the average weight is around 1350 at market time. The length of the feeding period will be four or six months, and the gains each day under favorable conditions are two pounds or more in winter and about two and one-half pounds in the summer on corn and grass. The gains made in summer are cheaper than those made in winter, and many feeders are now feeding in the summer instead of the winter as

formerly. Investigations by the Missouri Station showed that over half of the feeders in that and adjoining states have discarded winter feeding. Steers for summer fattening are usually bought in the fall and roughed through the winter without grain.

As an adjunct to beef-raising, in almost all of the eastern states, hogs are allowed to run with the steers and clean up the droppings. A considerable part of the corn passes through the steers undigested and is utilized by the hogs following. When ear corn is fed, the hogs will obtain from 10 to 20 per cent of the grain fed, not counting the cob. With ground corn they secure less. Sometimes the hogs have no other food, but when a large number of hogs are used some extra grain must be fed. The droppings are more completely utilized by stock hogs that are not obtaining all the grain they will eat. With whole corn, one to three hogs may follow each steer, while with ground corn one hog will clean up after two or three steers, or even more, in which case they will not repay more than 4 or 5 per cent of the cost of the feed.

The system of feeding above outlined is practiced throughout the corn-producing states, and thousands of cattle are fattened in this manner every winter. In the states following this method of cattle-feeding, the experiment stations have conducted a large amount of valuable experimental work along the line of fattening steers, and have published many good bulletins. Nearly all of the books as well as bulletins on cattle feeding have likewise been published in the Corn-Belt. Consequently 95 per cent of the literature on cattle feeding refers to a system of feeding practically the same as outlined above. On this account we have described this system somewhat in detail

although it must be distinctly understood that cattle fattening in the West is carried on in an entirely different manner, as outlined in the following discussion.

FATTENING ON HAY ALONE

In the West there is no corn, and the grains that are at hand are so high-priced that their use leaves little profit to the feeder. Feeding with grain, while the steers are on rich pasture during the summer, is also impossible in this region, partly because of the high price of grain, partly because of the absence of rich blue-grass pasture, and more especially because the gains made on the range during the summer are so much cheaper than can possibly be produced on any tillable farm. On the other hand, however, the western feeder has the advantage of plenty of alfalfa or clover hay at a lower price and of a higher quality than any hay with which the eastern feeder is familiar. The abundance and cheapness of this hay makes it possible for the western cattle-man to fatten steers in the winter as cheaply as can be done anywhere. In the Corn-Belt the problem is to insure the best possible use of the corn, while in the western states it is the problem to obtain the best possible use of the hay without any grain at all. Western cattle feeding has developed only in recent years. It could not exist until the great irrigated alfalfa hay fields had been developed, and furthermore, with corn selling in the Corn-Belt at 15 to 30 cents a bushel, as it was for many years, the western man could not meet the competition even with alfalfa at $4.00 a ton. But with corn at fifty cents and western hay at $5.00 to $6.00 in the stack, the advantage is the other way, at least for a medium grade of steers. Fancy

beef is not often produced in the West because it requires grain in addition to the hay.

Steers fed on hay alone consume from thirty-five to forty-five pounds daily providing the hay is good, and make a daily gain of one to one-and-one-half pounds. The feeding period is not as long as in the East, usually three to five months. Counting hay at $6.00 a ton, the cost of one pound of gain is from 8 to 12 cents, and for a good profit there is required a margin of about one cent a pound for 120 days' feed. By margin is meant the difference between the buying and selling price a pound or 100 pounds. For example, let us assume that a steer is bought for $4.50 a hundred pounds and sold after an increase of 200 pounds for $5.50 a hundred. Assuming the cost of the gain to be 8 cents a pound, the profit must be in the increased value of each pound of the whole carcass. The fattening process makes the carcass better and hence more valuable, leaving out the gain in weight. Under the conditions named, if the steer weighed 1000 pounds at the start, the original cost at $4.50 would be $45.00. The 200 pounds of gain would cost 8 cents a pound, bringing the total cost of the steer up to $61. He now weighs 1200 and if sold at the original price of $4.50 a hundred weight would bring $54.00, making a loss of $7.00. But because of the better beef he will make, he sells for $5.50 a hundred weight, thus bringing $66.00, and a profit of $5.00. The margin required to make a profit varies with a number of factors. High cost of feed, of course, increases the margin required. Small steers also require slightly more margin than large ones.

When steers are low in price, more margin is required than when they are high, providing the price of feed remains the same. For example, if the cost of a pound of

gain was 8 cents and the selling price of the steer was 8½ cents, a very fair profit could be made without any margin whatever. At the present time cattle are considerably higher than the prices listed above, and the margin of price between thin steers and fat steers is somewhat less than $1.00 a hundred pounds.

The margin required to make a profit and the margin the feeder may receive, are not necessarily the same. Any factor which makes the steers fatter increases the selling price and therefore increases the probable margin. Mere increase in weight does not increase the margin. The increase must be in fat so as to make the beef better and to raise the dressing percentage. There is, therefore, usually more margin in older steers than in younger ones, because more of the increase in weight goes to fat and less to growth. Rapid fattening will also bring a greater margin than slow fattening, for similar reasons. A two-year-old steer which is made to gain 200 pounds in 200 days might not be any fatter than when he began and so would sell at the same price a pound. A similar steer which is made to gain 200 pounds in 100 days would necessarily put much of the increase into fat rather than into growth and as a result would sell for a higher price a pound. Unfortunately, the chief factor affecting the margin actually obtained is the condition of the cattle market. If the price of cattle goes up during the fattening period, the margin will be large; if the price goes down, the margin will be small, or may be wiped out entirely. This factor is entirely beyond the control of the feeder and he must take his chances. If the price of cattle remains unchanged, however, a good steer weighing from 1000 to 1200 pounds at the start may be fed from 120 to 150 days on first-class hay and be made to gain about 175 pounds, at the end

of which time he will sell on an average market for about $1.00 a hundred pounds more than at the start. In other words, 175 pounds of fat put on a good steer will, on a steady market, make him worth about $1.00 more for each hundred pounds, which in turn will allow a fair profit on cheap feed. To the beginner the fluctuations of the market seem all important, but the old-timer does not bother so much about them. He figures that what he loses from a drop in prices one time will be regained by a raise some other time. The averages are what count.

BUYING STEERS

Feeding steers are usually bought locally, since, in the West, there are no large open markets for feeder cattle such as are found in the East. Denver is a feeder market but the buyers are largely from the Corn-Belt. The western feeder must buy direct from the producer or wherever he can, and must be something of a judge of steers in order to make a successful purchase. His judgment is all the more important when he has to buy by the head; for in this case he not only has to estimate their value by the pound, but also has to guess their weight, and as may be readily seen, it is only too easy to miss the true value of a steer by several dollars. Experienced feeders study their animals very carefully and often become very expert in judging their weights and values, but it is necessary that they follow the market reports very carefully. By frequent shipments to the large centers, they become familiar with conditions there, and by seeing cattle sold and then comparing their observations with the market reports for that day, they are able in the future to interpret the reports with far greater accuracy than they could other-

wise do. This ability to estimate quickly and accurately the value of a steer is just as necessary as the ability to feed properly, and requires both training and natural ability to a greater extent than any other branch of beef production. The beginner should ask the advice of some older man, and should start with a small number of cattle, say a carload. There is much risk in cattle feeding, especially as it is carried out almost entirely with borrowed money. One hundred steers is not an enormous number to feed, yet they will cost at least $5000, a larger sum than most farmers have to invest for a short time. Also it is cheaper to borrow for a few weeks than to keep the money lying idle for eight or nine months of the year. A reliable farmer who has the feed, or the money to buy it, will have no trouble in borrowing money at the bank with which to buy the cattle.

The kind of steers to feed will largely depend on the price paid for them. There is no steer, and no cow or bull, that is too poor to feed with profit if bought at a low enough price. Under western conditions, however, as they usually exist, the most profitable feeder is the square blocky steer with a straight broad back, a deep flank and weighing about 1000 pounds. He should show no signs of dairy or unimproved blood, should not be rough and above all should be in good flesh at the start. Steers that are not already in almost killing condition would better be roughed through the winter and given another summer on grass. The younger the steer, the better, providing he has the weight. One should look out for steers that have been topped a few times. The most thrifty cattle become fat first, and the first man who tops the bunch secures these good ones and by the time it comes around to the last man there is little left but cattle that are naturally poor doers.

Of course a poorer steer will turn a profit if bought cheaply enough, but in the West where the cattle are bought from the producers, it is difficult to buy the poor cattle at their real value. A few years ago everything sold for so much a head regardless of weight or quality. Now selling is mostly by weight, but there is still a strong tendency for everyone to want the same price a pound and the man with poor cattle is usually hard to deal with.

The class of cattle fed in the West is much more uniform than in the East. Western feeders handle practically no calves or yearlings nor do they produce the extremely fat heavy cattle sometimes found in the central states. These fancy cattle require long feeding on heavy grain rations and cannot be produced on alfalfa alone. Furthermore the western markets do not demand this class of cattle and cannot pay a price that will justify their production, while the distance to the eastern markets is so great that it is hard to get fancy cattle there in good condition.

Alfalfa fed to the proper kind of cattle will produce a steer weighing about 1100 to 1300 pounds and dressing 57 to 59 per cent, which, fortunately, is a very practical steer for both producer and consumer.

Steers fat enough to dress out 60 to 65 per cent are very expensive to produce and their carcasses contain a great amount of waste tallow, all of which makes the cost of the beef to the consumer so high that only the ultrawealthy can possibly afford it. On the other hand, the thin steers dressing 48 to 55 per cent make tough watery beef and the average consumer is willing to pay enough more for a better steer to justify their production. Of course there is some demand for all grades of beef but by far the greatest demand, cost considered, is for the steer free from any

noticeable evidence of dairy or scrub blood and fat enough to dress somewhere between 56 and 60 per cent.

In purchasing feeding steers, it should be especially borne in mind that fat steers are always worth more than thin ones of otherwise equal quality. Thin animals make very good gains, but must be purchased at a very low price as it takes a long time to finish them for market. It seems very difficult for beginners in the cattle-feeding business to realize this.

METHOD OF FEEDING

When hay alone is fed, the method of feeding is very simple. Large hay racks are built as shown in Fig. 6. The racks as shown are six feet wide, six feet high

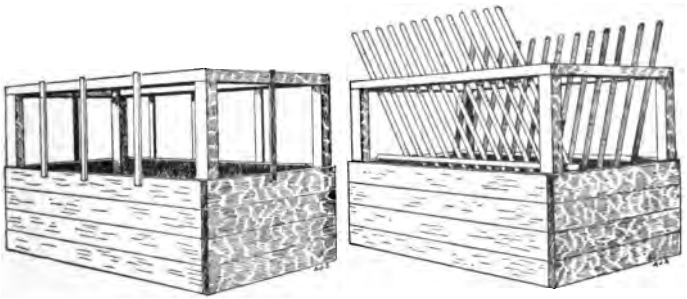


FIG. 6. — Two Good Hay Racks for Cattle.

and about twelve feet long and will accommodate about four steers on each side, allowing three feet of rack room to each steer, which is about right for average cattle. Small dehorned steers require less space while large steers or steers with long horns will need three-and-one-half to four feet of rack room. The sides are boarded

up to a height of about two-and-one-half feet. In the first style it is expected that the steer put his whole head through between the uprights while in the second, only his nose. With the second it sometimes requires nice adjustment to have the slats just wide enough apart so that the steer can eat well and yet with no danger of his putting his whole head through and getting caught. Either rack may be made with the posts set in the ground or may be built on skids so as to be movable. Both racks are good and are in general use throughout the West. There seems to be little preference between the two.

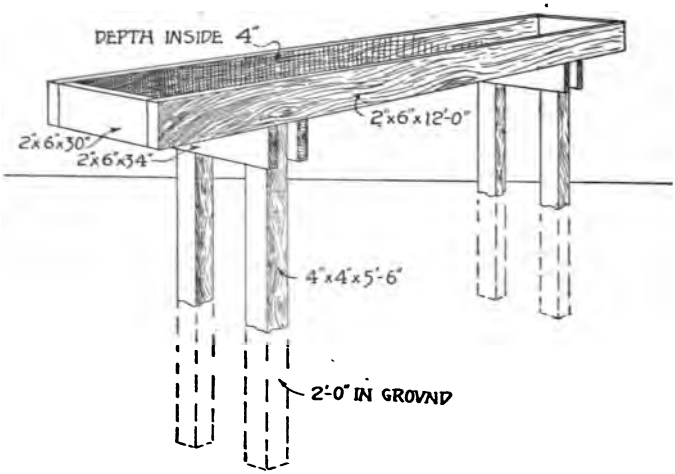


FIG. 7. — Bunks for Feeding Grain or Silage.

When grain is used, it is fed in bunks as shown in Fig. 7. This style of grain-bunk is in almost universal use wherever grain is fed to cattle on a large scale. The dimensions indicated may be varied a little. Amateur

PLATE II. — CHUTES AND FEED LOTS.

Above, dehorning and branding chute in operation. Note the squeeze side, the rope and windlass to hold the head down, the kind of saw, and the position of the cut. When the operation is done, the front end opens to let the animal walk out. Below, typical alfalfa ranch with feed-racks and yards in the foreground.

feeders sometimes feed from narrow troughs, about twelve or fifteen inches wide, but usually change to the standard feed-bunks after a year's experience. In building bunks, as with all other cattle equipment, strength is essential. In feeding grain, it is important that the correct amount of bunk room be provided. The steers should have plenty of room so that all may get to the bunks at one time; otherwise the timid ones will get nothing. On the other hand, there must not be much vacant space, since the greedy steers will get their grain eaten first and then go to the vacant space and obtain a second helping. As in the racks, about three feet of space for each steer will be needed; that is, three feet along one side or at the end.

The steers must be started with a small amount of grain and gradually worked up to the desired ration just as in corn feeding, but it does not take long to have the steers eating as much grain as is ever used in the West. Some find it profitable to feed no grain until about the last month or two, and then to use a little in order to give the steers a better finish and make them stand the shipping better, but the usual practice is to feed hay alone, making no attempt to use grain at all. The price of grain in the West is too high to enable the feeder to make much profit by its use. If the hay is of the best quality, a good gain may be made, and, while not as large as on grain, at a cheaper cost. But the hay must be good. Poor or damaged hay is not worth feeding for fattening purposes. It will produce nothing more than a fair growth, and the steers will be worth no more a pound when through than at the beginning. It is argued that the time to feed the grain is when the hay is poor; and it is true that good results may thus be obtained, but the gain all comes

out of the grain, and this brings the cost up to such a point as to be prohibitive. When hay is poor, no attempt should be made toward fattening steers, but such hay should be used for stock cattle. The Eastern Oregon Experiment Station has conducted three experiments in which one lot was fed straight alfalfa, one alfalfa and five pounds of barley a day, and one alfalfa alone for sixty days and alfalfa and ten pounds of barley for another sixty days. There were a carload of steers in each lot. Averaging the three tests, it was found that those on alfalfa alone in 120 days gained 112 pounds at a cost of $11.36 a hundred pounds; those on five pounds of barley gained 150 pounds at a cost of $12.10 a hundred pounds, while those getting ten pounds of barley during the last sixty days gained 141 pounds at a cost of $12.90 a hundred pounds. A somewhat similar test was conducted at the Colorado station as reported in Bulletin 102, where a lot of steers on alfalfa alone gained 1.5 pounds a day at a cost of $8.48 a hundred pounds while another lot getting an average of 6.6 pounds of corn a day in addition to the alfalfa gained 1.8 pounds a day at a cost of $10.03 a hundred pounds. In figuring the costs of gains in both Oregon and Colorado tests, the alfalfa has been figured at $6.00 a ton and grain at $25.00 a ton. These tests do not indicate any marked advantage for the grain. The hay alone in each case produced the cheaper gains, but the addition of the grain to the hay ration gave a larger gain and consequently about enough better finish to offset the added cost. In view of the fact that in many of the cattle-feeding districts grain is very expensive and hard to procure, its use would hardly seem advisable. The feeders themselves apparently take this view of the matter and very few cattle-feeders in the West use any grain.

AMOUNT OF FEED

The amount of hay will be no less than all that the steers possibly can be persuaded to eat. Eleven hundred pound steers will actually eat, with good hay and careful attention, about 35 pounds a day. In rare cases thay may eat as much as 40 pounds, but this is unusual. More commonly they eat 30 pounds or less, but a steer eating only 30 pounds of hay a day will not become fat, and will be fed at a loss. As steers will not eat the stems and coarser parts of the hay to good advantage, it is necessary to allow them to waste part of it, and in order to get a steer actually to eat 35 pounds of hay a day, he must be offered more than this, 40 or even 50 pounds a day. The stems and refuse hay are cleaned out every day, and given to stock cattle and horses. Horses will clean up the coarse hay that cattle will hardly touch. The amount of hay refused and cleaned out will of course depend on the quality of hay, but will ordinarily be from five to fifteen pounds a day. Tests at the Eastern Oregon Experiment Station indicate a daily waste of five to six pounds with choice hay carefully fed. The waste is not a dead loss as it may be used for stock cattle or horses and has a value of about one-half that of good hay. Hay should be given at least three or four times a day. When only a carload of cattle is being fed, all of the day's ration may be hauled at one load and sufficient hay may be put in the racks in the morning to last until night; but several times a day it will be necessary to stir up the hay in the racks, and push it around where the cattle can get at it better. Loosening up the hay in the racks in this manner is about the same as offering new hay, and every time a steer is offered fresh feed he will eat a little bit more. Hence the oftener he is fed the better. One cannot possibly expect to get steers fat

on hay by filling up the racks in the morning and then not going near them until the next day. Even feeding twice a day will not give satisfactory results as compared with feeding three or four times. When large numbers of cattle are fed, the feed is hauled continually throughout the day and the cattle are generally fed four to five or six times during the day. One man and a team can feed in this way from 80 to 100 cattle. The tops and bottoms of the stacks, if at all bad, should never be put into the racks, but rather scattered on the ground or fed to stock animals. If scattered out on the ground for the steers, they will waste all the bad parts of the hay; but it is much more economical to let fattening steers waste bad hay than to allow them to become hungry enough to eat it. Whenever the ground is dry or frozen and there is plenty of room, it is a very good practice to feed about one load a day on the ground the first thing in the morning. Cattle would rather eat hay off the ground than from the racks, and if fed one load in this way they will clean it up with very little waste. Experiments have shown that a lot of a hundred steers will eat about as much out of the racks during the day with this extra load on the ground as they will without it. When the cattle are allowed to run in a field of a considerable size, it is possible to scatter the manure over the field in this manner, but of course when the ground is muddy all the hay must be fed in racks. Chopped hay or alfalfa meal must be fed several times a day, just as the long hay, but ordinarily the cattle will clean it up well and there will be very little waste.

LENGTH OF FEEDING PERIOD

The length of the feeding period will not be as great as in the East where, as we have noted, it is usually about

six months. The average feeding period here will be from three to five months. After this time the gains are slower and consequently more expensive. A very high finish is difficult to obtain on hay alone and when obtained does not usually bring enough money to pay for the cost. It is the consensus of opinion among practical feeders that it does not pay to feed hay longer than four or five months, unless unusual conditions prevail. Four months is the most convenient time to feed on most ranches. The feeding cannot well commence before time to bring the cattle in from the ranges and, on the other hand, they should be out of the way in time to prepare for the spring work; and four months will usually about fit these extremes. The market and the amount of hay on hand influence the exact time of selling. If one starts with the intention of feeding three months he may see that there is a chance for a better price earlier, or perhaps he may not want to sell until after his hay is all gone, so as to avoid carrying feed over until the next season.

MARKETING

A fat steer full of feed and water will ordinarily weigh about 4 per cent more than if he has been without feed and water for twelve hours. On account of this variation in weight, allowance is often made in selling for this fill. This allowance is usually spoken of as "shrinking." When steers are sold locally, they are usually shrunk by standing twelve hours without feed and water or by weighing full and deducting 4 per cent. There is not much difference between the two ways of shrinking. When shipped to the large markets, cattle are not shrunk, and in fact obtain all the feed and water they want before

being sold, but in spite of this they will lack considerable of weighing as much as at home. A steer which weighs 1200 pounds when just out of the feed-lot and full of feed and water would be shrunk 4 per cent when sold to be shipped, which would make the shipper pay for 1152 pounds. After the steer has been on the train twenty-four hours and has been unloaded and filled with feed and water, he will not weigh over 1125 and perhaps only 1100. After a long shipment of five or six days, he will probably weigh between 1050 and 1100, probably about 1075. In shipping, from twenty to thirty steers are placed in the car, the average being twenty-five. There should be room enough so that if one lies down he can get up again. Eastbound rates are for 24,000 pounds in a car, whether you have that much in or not, and this means twenty 1200-pound steers, which will about fill an ordinary car. Westbound freight rates, however, are quoted at so much for each 36½-foot car, regardless of the number in the car. In this case, the shipper, to save expense, loads heavier than he otherwise would. If possible, one should secure a car with good racks and fill the racks well with hay; and one also should be sure the cars are well sanded. The watering troughs found on most cars are out of order and utterly useless.

According to the ruling of the Secretary of Agriculture, cattle in interstate shipments cannot be kept on the train longer than twenty-eight hours without unloading and feeding, except on written request, when they may remain thirty-six hours. The feeding en route is done at regular feeding stations which cater to this trade and which supply the necessary feed and water at a stated price. The railroads pay for this feed en route but collect from the shipper when the cattle are unloaded. There are feed yards at

each railroad division point. After arriving at the market, the stock is turned over to the commission man and there is little more for the feeder to do except watch the proceedings and learn what he can about the market.

In the Northwest the beef cattle are practically all handled either by the local butchers or through the Union Stock-Yards at Portland or Seattle. About the only exceptions are those cattle bought by Seattle and Tacoma packing-houses, and shipped directly to those places. The Portland Stock-Yards handle close to 90,000 head of cattle a year. Of this amount, Oregon furnishes about one-half, Montana about one-seventh, and California about one-tenth. The remainder comes from various parts of the West. The stock-yards in Seattle and Spokane are new. Seattle will probably handle about as many cattle as Portland, and Spokane somewhat less.

The Oregon packing-houses now buy nearly all their cattle through the Portland Stock-Yards. The Seattle, Tacoma, San Francisco and Los Angeles packers, however, send out regular buyers into the various feeding sections and buy directly from the farmers. With the development of the stock-yards industry, there has grown up a class of men known as "shippers," who make it a business to buy cattle from the farmer and ranch-man and then ship them to some stock-yard where they are sold in the open market. These men are usually able to buy this stock from the farmers sufficiently cheaply to enable them to make a profit. The chief reason for their existence is the fact that many of the farmers and ranch-men are afraid to ship to the open markets and take chances on what they may receive. The shippers, however, understanding conditions better and knowing about what the stock will bring, are thus able to make a profit. The only logical

method of marketing cattle for the beef producers is to ship their own cattle direct to the stock-yards instead of selling them to a shipper. The cattle are worth just what they will bring on the market and selling them to a shipper is merely gambling on the market, and gambling with men who know much more about it than the producers. Shippers will contend that on account of their experience and knowledge of conditions of the stock-yards, they can get more for their cattle when they ship them there than can the producer, but such statements are questionable. The chief value of the shipper is in buying less than carload lots. The expenses of making a shipment may be listed approximately as follows: Freight from point of origin to market; commission amounting to $15 a car; feed, including the small amount of feed which cattle will eat after arriving at the yard just before being sold; and yardage at 25 cents a head. In comparing prices received at central market with prices offered or received at home, the shrinkage must be considered, as noted in a previous paragraph. All expenses considered, cattle shipped a distance of 200 or 400 miles should be worth at home within about 50 cents to 75 cents a hundred of what they would bring on the market. That is, the expenses of freight, commission, yardage, feed, and the shrinkage would make the cattle net on the home weight about 50 cents to 75 cents a hundred less than the price at the stock-yards. With long eastern shipments of 1000 to 2000 miles, the difference in prices will be about 75 cents to $1.25.

COMPARISON OF FEEDS

Alfalfa hay forms the basis of practically all of the steer-feeding that is carried on in the West. In a few

localities, clover or wild hays are used in place of alfalfa, but there are many times the number of cattle fattened on alfalfa as on all of the other hays together. The chief reason for this is that the alfalfa meadows yield more and last longer than clover meadows. Clover is grown only in the section where grain is the chief crop, the clover being used as a rotation crop with grain. Because alfalfa is grown under irrigation and cured practically without rain, it possesses a very high feeding value, but not higher than that of clover raised under the same conditions; in fact, if there is any difference the clover is the better, especially when fed without grain, as is the general custom throughout the West. The almost universal preference for alfalfa over clover, therefore, is based on economy of production. Chopped alfalfa is now being extensively used throughout the West. Chopped alfalfa is alfalfa hay cut into lengths of about one-half to three-fourths inch by running through a large cutter. The alfalfa is stacked in the field in the usual manner and after it has stood for a few weeks so as to sweat out thoroughly, the cutter is drawn up beside the stack and the hay chopped, and then restacked in the field. It is surprising that the chopped hay stacks as well as the long hay, and seems to turn water as well. In the winter the chopped hay is fed in the same manner as long hay except that it is hauled in tight racks and handled with silage or coal forks. Alfalfa meal is similar to chopped alfalfa, except that the hay is ground up very fine. The meal has no apparent advantage over the chopped hay and since grinding is expensive, the meal is not widely used. The advantages of the chopped hay are ease of handling, saving of waste, and possibly an increased gain. One man can feed more cattle on chopped hay than on long hay, and the cattle eat it all up clean

without waste. Since the usual cost of chopping is about $1.50 a ton, when hay is worth $6.00, the saving must be around 20 per cent in order to show a profit. In a recent test at the Eastern Oregon Experiment Station, thirty-six steers on long hay gained 147 pounds in 120 days at a cost of $10.75 a hundred pounds, while another thirty-six steers on cut hay gained in the same time 177 pounds at a cost of $10.32 a hundred. In figuring these costs long alfalfa was valued at $6.00 and cut alfalfa at $7.50 a ton. The steers on long hay wasted five pounds a head each day while those on cut hay wasted 1.2 pounds. The additional gain made by those on cut hay gave them a noticeably better finish so that in this test, at least, the cut hay was without question profitable. Further tests, however, may change these figures. In some districts, notably the Big Hole country in southwestern Montana, the native meadows are irrigated, and are sown broadcast with some cultivated grass seed, such as rye-grass, in addition. These hays, after being carefully cured, have a very high feeding value; in fact, the finest hay-fed cattle are produced in this region. Something like 25,000 head are fattened in this way annually. In general, upland wild hay has a high feeding value, but that from the lowlands, especially where the land is swampy, will not be sufficiently palatable and nutritious to justify its use for fattening purposes. The Big Hole country is the only locality where any large success has been made of fattening steers on wild hay. Timothy hay alone will not fatten cattle. The price which it brings as a feed for horses, moreover, does not make it economical for cattle fattening, even though it had a high feeding value. Vetch hay, if cured properly, would be satisfactory for this purpose, but practically all the vetch is grown in western

Oregon, where conditions for curing are for the most part quite unsatisfactory. Thus far, it has not proved possible to produce hay in western Oregon or any other humid district that is good enough to fatten steers without grain. The demand for such hay for dairy and other purposes, moreover, makes the price prohibitive to the steer-feeder. It is argued by some that steers could be fattened on vetch hay, kale, and barley. This could be done, without doubt, but the cost under present conditions would prohibit it. At present prices, the gain which would be put on by such feeding would cost about 15 cents a pound, while 10 cents a pound is about the maximum cost which the industry will bear.

Of the grains which may be used as a supplement to the hay, either barley, wheat or oats will be satisfactory. These three grains have about the same feeding value, pound for pound, but a mixture of the three has proven superior to either one alone. When grain is used, ten pounds a day is probably the maximum, and five pounds a day the best. These grains may not have quite the same feeding value as corn, but they have never been thoroughly compared under similar conditions, and, at any rate, the difference is slight. Rye is used in a few localities and has a feeding value somewhat similar to that of wheat, although hardly as good and not as palatable. Speltz has been tried rather extensively, and when obtainable at a very low price may be used at a profit. Screenings from the elevators and flour mills sometimes have considerable feeding value, but sheep seem to use these screenings to better advantage than steers, and for that reason they are nearly always used for fattening sheep or lambs rather than fattening cattle, in spite of the fact that they are quite satisfactory for the latter

purpose. In the early days when bran was almost unsalable throughout the western states, it was successfully used for fattening cattle. Because of its bulky nature and high protein content, it is too much like alfalfa and hence not so good for fattening cattle as for dairy stock, and as a result is now used almost entirely for dairy cattle rather than for fattening beef cattle. Middlings are rather too heavy and pasty a feed for fattening cattle, and their value for hogs makes the price prohibitive to the steer-feeder.

Protein concentrates, such as oil meal, cotton-seed meal, or gluten feed, have little value in the West and are not used at all. The real need in western cattle-feeding is a cheap grain. Any of our common grains would be satisfactory if they were not so high in price. Wet sugar-beet pulp makes a very satisfactory feed together with good alfalfa hay and when the sugar factory is located in a cattle country, as are most of the factories in the irrigated sections, the pulp is commonly contracted to some large cattle-feeder who will arrange to feed his cattle at the factory so as to avoid hauling the pulp. The pulp carries about 90 per cent of water and it requires very little handling to cost more than the pulp is worth. Fifty to one hundred pounds of pulp together with all the alfalfa hay the cattle will eat provides a very satisfactory ration and produces a better steer than alfalfa alone. Beet pulp should feed out about two to three dollars a ton but there is a large amount of expense attached to the handling of it and is generally purchased at not over one dollar a ton. Dried pulp is being put on the market in a few places, notably California, but has so far been largely used by the dairymen, who pay more for it than the beef men think it is worth. The only beef men, therefore,

who are at present concerned with beet pulp are the large outfits having feed yards within a few blocks of a sugar factory. The sugar factories are largely located in the irrigated sections of Idaho, Utah and Colorado.

Silage for beef cattle under western conditions is so far an experiment. It may prove a great success, but at present there is too little known about it to justify any positive statements. Silage has proven its value to the beef producers of the Corn-Belt.

WHEN TO FEED CATTLE

For a man who raises neither hay nor cattle to buy both, unless he expects to secure some value out of either the clean-up or the manure, would not usually be advisable. But the ranchman who raises his own hay, or who raises his own cattle, and can procure hay at a reasonable price and close enough to feed on his own farm, will often find it profitable to feed, providing, however, that he likes cattle and is willing to study them and follow the markets carefully. Cattle-feeding is an attractive business, but is no easy task; and it takes but a very small break to lose a whole crop of hay. The successful feeder will usually be found very much interested in his work, and eager to talk cattle at any and all places. There is a certain fascination about handling cattle which when once felt, is hard to escape.

On the whole it would not be well to encourage any marked increase in the cattle fattening business. Rather extensive experiments and investigations conducted by the Eastern Oregon Experiment Station lead us to believe that the business is generally over-rated and that many of the feeders are not receiving as large or as cheap gains as

they think. It seems that one year with another there are rather too many cattle being fattened on alfalfa with the result that on one hand the price of feeder cattle is being forced above a normal level and on the other too many cattle are put on the western markets in March and April with a consequent lowering of the price. Somewhat fewer cattle on feed throughout the West would doubtless adjust matters so that all could make a fair profit.

CHAPTER VI

EQUIPMENT

THE equipment required for the raising of beef cattle is simple compared with the equipment required for the handling of many other kinds of live-stock. Perhaps the first and most important is a saddle horse and lariat rope. As the industry becomes more intensified, additional equipment is required. The second step will be a good set of corrals, and these in turn will be supplemented by branding chutes and scales. Following these will come fixed pastures and possibly feed-lots, with full equipment of feed-racks and watering devices. Then will come hay cutters, and, in some parts of the country, silos. Barns, in most of the West, would probably come last, since almost no cattle are kept under roof.

BARNS

With a few exceptions barns in the true sense of the word are unnecessary for commercial beef in the West, although in exposed localities bedded sheds are very useful. These are merely long sheds opening away from the wind and large enough to bed down all the cattle. They are very simply constructed and aim only to keep off the wind and storms. Rough boards are generally used for both sides and roof. Plenty of bedding is essential to obtain the real value from a shed. It is almost never

necessary in the range countries to provide cover for the feed-racks or for the hay.

Natural shelter is in many places as satisfactory as barns, as places protected from prevailing winds and storms by hills, timber or brush and on well-drained ground where there will be little mud. Cattle sheds are rare in the range country even among the best cattle-men, but we find the good managers all very carefully picking out the most sheltered spots for their winter feeding. In much of the semi-arid country, cattle will do better in a place well protected by nature but without sheds than in an exposed position fortified with a number of expensive buildings.

In the rainy district of the Pacific Northwest, real barns are required and they must not only shelter the cattle but the hay and feed-racks. The popular barn throughout all this region has the hay extending from the ridge pole down to the ground and with racks and cattle sheds around two or three sides of the central portion or hay barn. The hay is forked directly from the mow to the feed-racks. Dehorned cattle require about three feet of rack room and fifty to sixty square feet of floor space for each mature animal. Horned cattle require more room and are a nuisance in a barn regardless of the amount of space allowed.

FENCING

Without question the best fence for cattle is a good woven-wire type, about forty-two inches high with a barb wire on top about six inches above the top of the woven wire, but such fences are usually too expensive for commercial cattle so that as a matter of economy one is obliged to resort to the old-time barb wire. Three barb wires

make a fair cattle fence but not one that is really satisfactory, especially for calves. Four barb wires, however, make a strictly first-class cattle fence for inclosing large pastures and ranges, although it will not turn calves or any other kind of cattle if they are crowded into a corner. Five barb wires make a slightly better fence for cattle than four, but hardly enough better to justify the expense of the additional wire, and this extra wire at the bottom of the fence makes it much more dangerous for horses. The posts for such fences are placed about a rod apart, and this is close enough for all ordinary purposes. A three-wire fence stretched very tight is better than four wires a little slack.

CORRALS

In the building of corrals of any kind, the first and most important consideration is to build them so that the cattle cannot possibly get out. This seems simple enough, but unless one is fairly familiar with the handling of cattle he will underestimate the ability of the average steer to escape from a corral. The fence must be at least six feet high and exceedingly strong. There are four common ways of building corral fences. The first is by putting up a pen of heavy poles, having the ends rest one on top of the other between pairs of heavy posts tied together with wire, thus building up the fence after the manner of a log cabin. If the fence is well made, this is an excellent method, and is especially adapted to small round corrals. For long straight corral fences, it is not so satisfactory unless the posts are exceedingly heavy.

The second method is that used by all the leading stockyards. In this style of fence the posts are set deep in the

ground, about eight feet apart and six feet above ground, with boards nailed crossways. The boards are two inches thick and not less than eight inches wide, and from three to six inches apart. They are always placed on the inside of the post, and in case of division fences on both sides. This is the most expensive under the average farm conditions, but at the same time not sufficiently expensive to prevent its use. In fact, when the material must be bought, it is about as cheap as any method.

The third common method is a plain board wall, made perfectly tight out of inch boards set upright. The posts are set eight feet apart, with crossbars, to which the upright boards are nailed. When built in this manner, the fence does not need to be nearly so strong as when it is made open so that the cattle can see through. If the cattle can neither see over the fence nor through the cracks, they will not make nearly as much effort to get out. This type of fence also serves as a windbreak, which is often of great advantage around the barns or feed-lots in a windy country. It can also be made to look well, especially when the boards and crossbars are made of dressed lumber and nicely painted. This style of fence is not used as much as it should be. (See Fig. 8.)

The fourth method of building corral fences is the old-style stake fence, formerly rather common in the range districts. It is built of posts only and has no cross bars of any kind. The posts are set as close together as they can stand, and are made as high as desired. Usually the tops are fastened together by one or two wires or strips of rawhide running around the top. In the early days of the range industry posts and lumber were practically out of the question and in the desert regions where the only building material obtainable was scrawny juniper or

willow poles, this style of fence was popular. It is very strong, and there is no fault to be found with it from the viewpoint of holding the cattle, but where lumber or

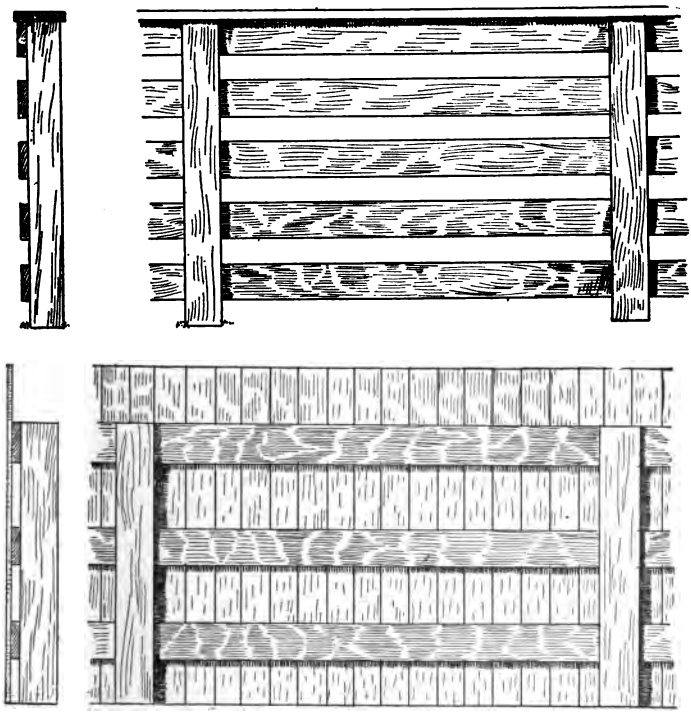


FIG. 8. — Two Methods of Building Corral Fences.

straight poles may be obtained at a reasonable price, other forms of fence are usually cheaper and more satisfactory. (See Plate III.)

On most farms it will be necessary to have more than one corral so that the animals may be separated into differ-

ent bunches. The corrals should be separated by suitable gateways, and the branding chute should also open from one to the other. If the two main corrals can be separated by one or more small pens, it will be a great convenience, since a few animals can be run into the small pen and there separated or run into the branding chute much easier than directly from a large corral containing a hundred or more cattle. When it is necessary to do much roping either for branding, castrating, or other purposes, a small branding corral with a snubbing post in the center will be necessary. The snubbing post must be heavy, set well into the ground, and thoroughly tamped. The height will vary according to the fancy of the user, but three to four feet is usually about right. The branding corral itself must be circular, without sharp corners or other projections. With any other shape the animals will crowd into the corners and may injure each other or break the fence, while in the round corral they keep going round in a circle and find no corners to stop them. For roping this is especially important, since if the corral is of the proper size, the roper may stand in the center while the animals chase around the outside, giving him a fair chance to throw. With the rectangular corrals the cattle jam into the corners so that it is almost impossible to get at them with the rope. The diameter will depend to some extent on the number of animals to be held, but for good work, forty to sixty feet will be found to be the best. The roper should be able to stand in the center near the snubbing post and catch the animal desired as the bunch pass around the corral. If the corral is smaller than the limits given, there will not be room enough for good work; and if larger, the roper cannot reach all parts of the corral from the snubbing post. For general use the fifty-foot size

will probably be the best. If a larger number of cattle are to be handled than can be held conveniently in a fifty-foot corral, two small corrals will be very much better

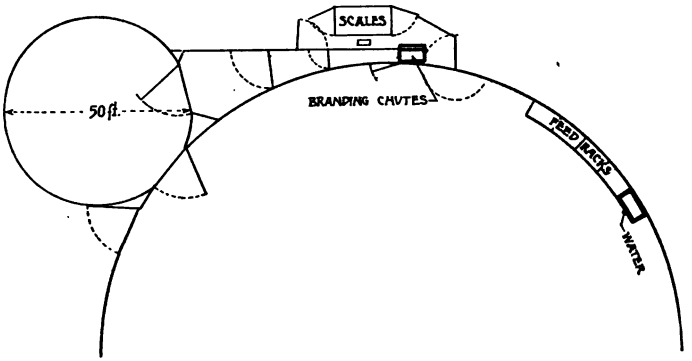


FIG. 9. — Model Corral System.

than one large one. There is no greater convenience on the stock farm than a set of corrals that can always be depended on to hold anything and everything that is put into them. (See Fig. 9.)

SCALES

The old system of selling cattle by the head is disappearing so rapidly that every well-equipped stock ranch now has wagon and stock scales. When such scales are intended for stock use only, or for wagon use only, the location and equipment are easily arranged; but in case they are to be used for both cattle and wagons, some little study and ingenuity may be required to place them so that both may be weighed conveniently. It will be necessary, of course, to have them placed adjoining the corrals or

chute so that the cattle may be run on them without difficulty or inconvenience. It is often as hard to put a steer on the scales as it is to get him into the branding chute. The scales, moreover, must be placed in such a manner that the stock-rack may be removed and wagons driven on. The make or kind of scale is not so important, as nearly all of the standard scales now on the market give very good satisfaction. Between the pitless scale and the pit scales, when one is buying, it is largely a question of which kind one can afford. The old type of pit scales probably last longer and give rather better service than the pitless ones, but they cost more. Not only is the first cost of the scales greater, but the cost of installing pit scales will be equal to the original cost of the scales. After the scales are properly installed, the rack for holding the stock must next be prepared. There are various plans for building these racks, but the good ones are very much alike. The essential point is strength. In building a rack for weighing cattle, it is a safe rule to build one about three times as strong as seems necessary. The common method of building is to use 4×4's for the posts, using four or five on a side. The method of bracing and putting on the siding is shown in Fig. 10. For siding, 1×6's about two inches apart at the bottom should be used and gradually widened until they are about six inches apart at the top. It is the common practice to make a gate at each end of the scale-rack so that the cattle may be run in at one gate and out at the other, but this is not absolutely necessary, since the corrals may be so arranged that the cattle may be put out at the same gate they came in but into a different corral from that from which they came. By having only one gate, the rack may be made considerably lighter and at the same time very much

stronger than when it is necessary to make a gate at each end. When it is expected to weigh both wagons and cattle on the same scales, the best method is to set the rack on runners, placed crosswise of the scales. About three runners, one at each end, and one across the middle, will be satisfactory. These runners may be made of 4 × 4's

FIG. 10. — Scale Rack for Weighing Cattle.

and the upright posts fastened solidly to them. In order to keep the scale racks from slipping off the scale platform, bore a hole through the middle of each end runner and on through into the scale platform. Loose bolts dropped into these holes will prevent the racks from slipping. The ground to the side of the scale platform should be leveled up to the same height as the platform, and when it is desired to move the rack it can be slipped off to one side. Wheels or rollers are sometimes put under the rack in order to make it move easier, but this is not necessary, unless the rack is to be moved every day or two.

The cattle corrals should be on the side of the scales next to the box and about as close to the box as will permit

easy access to the beam. The gate from the corral or chute to the scales should be placed just in front of the scales, and made about eight or ten feet wide. The gate may then be swung outward to meet the scale gate, and by fastening the two together a chute is formed direct from the corral to the scale-rack. Yet when the gates are closed and the scale removed, there is nothing to prevent easy access of wagons and teams to the scales. If the scale-rack is made rather high and with a gate at each end, a team and wagon may be driven through without removing the rack, but this arrangement is useful only in weighing small loads of grain; it cannot be utilized for loads as large as a load of hay. Cattle-racks are sometimes made with the sides hinged at the bottom so that they may be dropped back far enough to allow a load of hay to drive through, but these racks are practically never strong enough to hold western cattle.

Special attention should be given the arrangement of the corrals, so that the cattle may be brought to the scales with the least amount of difficulty. Not only does running the cattle around the corral waste much time, but it likewise runs the flesh off the steers and causes shrinkage. If the corrals are so arranged that the cattle may be weighed without running them around or exciting them in any way, they will often weigh as much as five or ten pounds a head more than if weighed from corrals that require a good deal of running to get them on the scales. A model arrangement of corrals, chutes, and scales is shown in Fig. 9. This system includes the good points in corral construction from various western ranches.

CHAPTER VII

BRANDING AND MARKING

THE branding of cattle is such a simple operation as to need very little elaboration in the way of explanation or instruction. The difficult part of the operation is usually to catch and hold the animals. On the open range this is usually done by roping by the neck and by the hind legs. Then, by pulling in opposite directions, the animal is thrown and stretched out in the position that it is impossible for him to make much of a struggle when the iron is applied. This method has the advantage of requiring no corrals or chutes, but is slow; and is hard on both the calves and the horses. It also requires some skill in roping, although if the operator is used to handling a rope, it may be about as easy to get the rope on as to get it off. Considerable branding is done by a method that is similar except that a stout corral and a snubbing post are used. The animal is roped by the neck or horns and snubbed to the post in the center of the corral. Then a rope is put on the hind legs, usually by throwing it over the rump when the animal can be made to move around a little so that he will soon step into the rope. Then with a flirt and a quick jerk the rope is dropped down around the hind legs and drawn tight. By a strong pull with a horse, the hind legs are pulled from under the animal and he is thrown and held while being branded. This method

is not at all difficult, the only trouble being that if the rope is not properly managed when it is dropped down off the hips, the animal may kick out of it with one foot, if not with both. The method is not very fast, and is hard on the animals, causing much excitement in catching, and also "wooling" them around more than is desirable. It is, however, convenient for the farmer who has only a few to brand and is about the only method for castration.

The modern method of branding, however, is with a "mash" or chute with movable sides. This method of branding is faster, and easier on the animals than the roping process, although this depends largely on the conveniences that have been arranged for getting the cattle into the chutes. If the corral is large and only a short wing of twenty-five or thirty feet is used, there will be much difficulty in persuading the meaner cattle into the trap; but if a larger wing is used, and especially if it is divided with one or more stop gates, the cattle can be put in as fast as the iron can be applied.

The essential point in regard to branding irons is that the design be simple and the iron large. Small complicated designs are easily blurred out, and even if they are put on correctly, long hair soon covers them over so they cannot be read. A good brand must above all things be legible. A brand that cannot be read until the animal is sheared is an abomination. If the iron be large and simple and properly applied, the brand should be legible all the year round. The actual size will depend on various things, but in general each letter, if letters are used, should be seven or eight inches high and M's and W's even larger. The stock of which the brand is made should also be large, three-eighths to one-half inch across the face. The depth of the stock is not so im-

portant, but if it is an inch or more the heat will be retained better. Copper is by far the best material for making irons, since it holds the heat much better than iron. It is expensive, however, and if the heating facilities are good and the branding not carried on with extreme rapidity, iron instead of copper will answer very well, or for rapid work several iron brands may be used. For heating the iron, a large hand forge is the best, but they are not always readily available. Old stoves are sometimes used, and quite successfully. The common method, however, is the open bonfire, which does very well, but is troublesome and takes a lot of good dry wood.

The temperature of the iron has much to do with making a permanent brand. Long-haired cattle require a much hotter iron than short-haired cattle. In all cases the iron must be hot enough to make a good blister everywhere it touches, which usually means a good red. There is very little danger of having the iron too hot, but much danger of not having it hot enough. The injury to the animal may be greater with the moderately hot iron, since it is often held to the skin for some time, and although the skin may not be much affected, the heat has time to penetrate to the tenderer tissues beneath and do more damage and cause the animal more suffering than if the skin were burned to a crisp by the almost instantaneous application of white-hot iron. This same principle is well illustrated in horse-shoeing. Veterinarians know that serious injury to a horse's foot seldom comes from the application of a red-hot shoe, for the scorching warns the shoer to take it away, but the serious injury comes when the shoe is not quite hot enough to scorch, and is therefore left in contact with the foot long enough for the heat to penetrate into the tenderer tissues below, thus producing serious

and lasting injury. With horses, the brand is applied almost instantly, but with cattle the iron must be held to the skin for a moment, since it takes a little time for the hair to burn through. If the iron is very hot, however, the work is performed as soon as the iron strikes through the hair. One should not be satisfied, however, with brands that only affect the hair. They look all right, but in the fall they cannot be found.

Another very important factor in making a brand legible is the way the animal is held. If held absolutely solid so that he cannot jump around and cause the iron to slip, a good brand can be made; but if he can move at all, a blur is sure to result. One of the strong points in favor of the chute method of branding is that the animals can be held more securely so that there is less danger of blurred brands.

The common locations for the brand are the hips, thighs, sides, and shoulders. Of these, the hips and side are by far the best. Between the two, the preference is for the hips. When animals are running out in the open, a brand on the side can be more easily seen; but when crowded together in a corral or cutting pen, the hip brand is more convenient. If the brand is placed on the side it must be well up toward the backbone, for otherwise it cannot be seen when the animals are crowded. A larger brand can be placed on the side than on the hip, although a brand larger than can be put on the hip is seldom necessary. The shoulder presents an excellent surface on which to put a brand, but the animal must stand broadside toward you and there must be no other animals in the way or the brand cannot be seen. The thigh brand also cannot be seen when the animal is in a bunch. This is a very important consideration, since it is essential that the brands

be in view when the cattle are corraled for cutting out and separating. The whole object of branding is so to mark the animals that their ownership may be known at all times, and to accomplish this, it is necessary that the brand be large and plain and on a spot where it may be easily seen when the cattle are bunched together. In making the brand legible, then, the essential points are a large iron of simple design, made of good, wide stock, applied red hot when the animal is held so as to be absolutely immovable.

EAR-MARKING

Ear-marking is practiced by many cattle-men in addition to branding. Various slits and notches are made in the ears, according to the fancy of the owner, he, of course, adopting one certain form as his particular mark. The number of combinations is limited, so that only a comparatively small number of stockmen can have different ear-marks. They are also in some cases easily changed. Ear-marking is not then a substitute for branding, but a supplement thereto. Calves can be and should be marked as soon as they come, but they would be in no condition to withstand branding at this age. They are thus marked at an early age when there is the least danger of being lost or stolen. The ear-mark is also very convenient as a supplement to the usual brand on matured cattle and affords a double means of identification. It is also more legible than the brands, especially in the dead of winter when the hair becomes long. In looking over a bunch of steers, the owner knows that those without his mark on the ears are not his, without going to the trouble further to identify the animals by examination of the brands.

BRAND LAWS AND INSPECTION

In most states brands must be registered with some authorized state official before they can be recognized as any proof of ownership. Duplication of brands is not allowed; that is, every man in the state must have a different brand. Cattle-men running stock close to the state boundary usually have their brands recorded in both states. The details of brand registration vary with the different states and furthermore may be changed from time to time. Exact information for any state may be obtained from the agricultural college, the state veterinarian, or any prominent stockman.

Nearly all western states have laws requiring the inspection of the brands of cattle shipped out of the state. The inspection is usually made at the point of shipment and a permanent record is kept of all branded cattle shipped. Of course the details of inspection vary in the different states. In addition to these local inspectors, the state cattle-men's association commonly employ salaried brand inspectors at the large market centers to inspect the brands of all cattle shipped from the territory of their association. Sometimes in the smaller markets, two or more states combine to employ an inspector. While these inspectors are in private employ, state laws usually give them certain police authority and allow them to stop payment on any stock when the ownership is questionable. The object of brand inspection is to discourage stealing, to make prosecution easier where theft has occurred, and to aid in the restoration of strays. The inspection at the large market centers is usually very thorough, but that done by local inspectors at the shipping points is not always so carefully or so competently performed.

CHAPTER VIII

PURE-BRED CATTLE

In previous chapters we have dealt exclusively with the production of commercial beef which, owing to the scarcity and high price of pure-bred beef cows, is almost entirely produced from grade females, although the use of pure-bred bulls is general and should be universal. The man with pure-bred cows does not as a rule try to raise steers for beef but rather good bulls for the range trade. A few of the poorer bulls will be castrated and sold for beef. The discarded cows will also be slaughtered, while the surplus heifers will go to the founding of new herds of pure-bred cattle. The breeding of pure-bred cattle and the production of beef are, therefore, two separate and distinct lines of business yet closely linked together by two facts; the beef producer must look to the breeder for his bulls, and the breeder must look to the beef producer for a market for these bulls.

THE MAN

The breeding and handling of pure-bred beef cattle require a somewhat different type of man from the handling of commercial stock. He must first of all be a very keen judge of animals and he must be a good feeder and a good salesman. The latter point cannot be emphasized too strongly. There is an established market and es-

tablished prices for all forms of commercial cattle and one man can get as much for his stock as another, but pure-bred cattle is another proposition and salesmanship on the part of the owner enters very largely into the success of the operation. A successful breeder of pure-bred cattle must also be a man who reads and travels to some extent in order to keep himself well informed on pedigrees and on the work of other breeders. A successful breeder should also have working knowledge of the handling of commercial cattle and should above all know the kind of cattle which the trade demands.

LOCATION

On account of the value of the stock and the necessity of keeping an exact record of each individual animal, it is not practical to run pure-bred beef cattle on the open range, although they may be run in well-fenced bunch-grass pasture. Generally speaking, a ranch for the raising of pure-bred cattle must afford much better feed than one suitable for commercial beef. Breeders of pure-bred cattle are of two kinds. The first is the constructive breeder who aims to obtain the very best stock which the breed affords and from this build up a herd which is even better, if possible, than anything which has existed in the breed heretofore. The surplus from such a herd will not be sold to the beef-producer but rather to other breeders of pure-bred cattle. The other is the man who does not attempt to breed the very finest but rather to breed on a larger scale and to furnish good bulls to the beef-producers at prices which the latter can afford to pay. We find the bulls produced by these two men similarly grouped. The bulls suitable to head a herd of good pure-bred cows

are designated as "herd headers," while bulls of somewhat less quality and merit, but still very satisfactory for use on grade herds, are designated as "range bulls." The class of cattle one intends to breed has some influence on the farm selected and if it is intended to breed largely range bulls, one can handle a considerable amount of bunch-grass pasture and it should preferably be located close to some beef-producing center. If handling the higher class of cattle, however, one must obtain a rich well-tilled farm that grows plenty of hay, grain, silage, and luxuriant pasture and it must be located close to some good railroad point. In all cases it must be borne in mind that pure-bred cattle, to be made a success financially, require better feed than do commercial beef cattle, and the man who expects to raise bulls in the same manner that he raises steers is doomed to disappointment.

FOUNDING THE HERD

Since the success or failure of a herd of pure-bred cattle is largely determined by the first purchases, it is not wise to rush blindly into the purchase of a large number of breeding stock until one has become thoroughly familiar with the standards of the breed. We offer the suggestion, therefore, that anyone contemplating founding a herd of cattle should study the matter for at least a year before making any purchases. One should visit the leading fairs and find out the class of cattle which the other breeders are handling, and something of the type of cattle which they are trying to breed. Also one should study the leading blood lines so as to be able to interpret pedigrees. The public auction sales are good places to learn something of the judgment of other breeders as to the

financial value of cattle and of blood lines. The most expert judge of commercial beef is not competent to buy pure-bred cattle until he has had a course of training of this kind. It should be borne in mind from the outset that with any improved breeds of live-stock there is some tendency for them to revert back to the unimproved form and usually the more highly they have been improved the greater the tendency for reversion. The man, therefore, who buys a bunch of cows at $250 a head and a bull for the same price and expects to sell the offspring for $250 a head will be disappointed. About the only way which the $250 cows can be kept producing $250 calves is by the use of a bull of a much higher quality, and on that account it is usually found necessary to pay three or four times as much for a bull as for the cows. We would hesitate to say that it is always advisable for the beginner to buy only the very highest class and highest priced animals, but we would warn the prospective breeder against inferior pure-bred stock. The cattle must in all cases be good useful stock of such quality that the bulls will be capable of producing a marked improvement on the average herd of good commercial beef. Sway-backed, cat-hammed, or slab-sided bulls are worthless no matter how imposing the pedigree.

FEED AND CARE

As previously indicated, pure-bred cattle require better feed than will grade cattle. This is not because they will not do as well on poor feed as will grade cattle, but because, in order to make a commercial success of pure-bred cattle, they must be kept in a higher degree of flesh and growing more rapidly. Breeding cows do not need to be

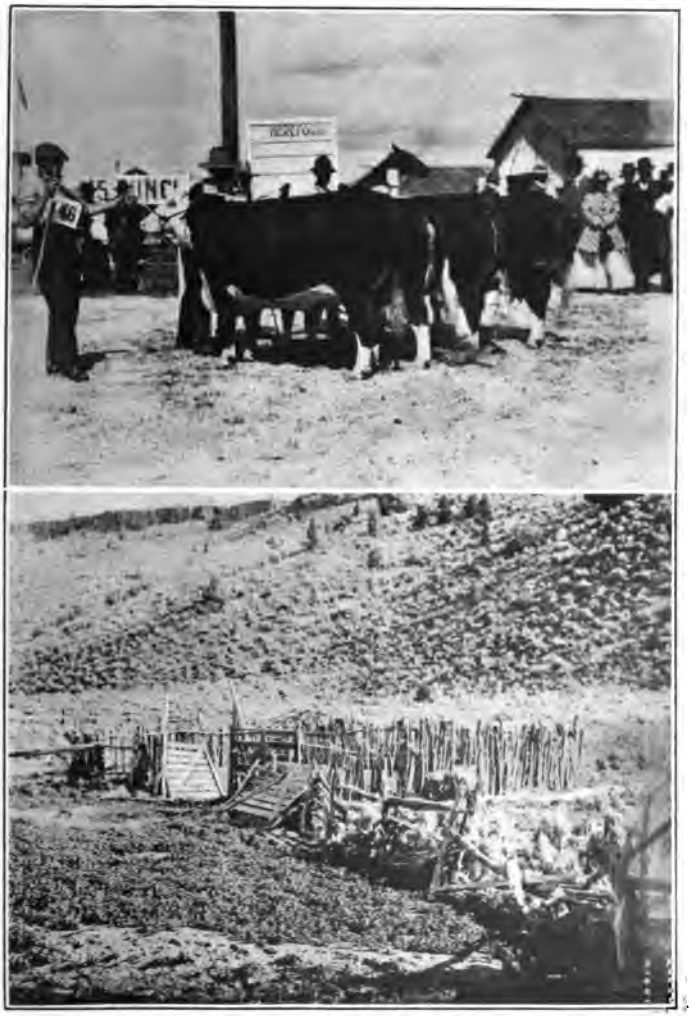


PLATE III. — THE NEW AND THE OLD IN THE WEST.

Above, Herefords at the Spokane Interstate Fair. Below, old time corral near Prineville, Oregon.

kept in high flesh but must be handled in such a manner as to give the largest quantity of milk for their calves. The calves, however, which are intended for sale, especially the bulls, must be kept fat and growing from the very day of their birth. The bulls are usually sold at about a year to a year and a half of age, and when selling time comes they must be fat and have plenty of weight for their age, and this fat and weight can be obtained only through the medium of liberal feeding. The feed that will produce a good steer will not make a satisfactory bull for two reasons. First, the bull is restless and quarrelsome and will not make as good use of scanty feed as a steer; second, the beef-producer will not buy a bull that is not finer looking, fatter, and above all, bigger for age than the steers which he has at home. It is said by some that the poorly fed bull will be as good a breeder as the one that has had better treatment. This may or may not be true, but it is absolutely certain that a bull will not sell for his true value if he does not have good weight for age and does not have meat on his back.

Calves born in the spring should be taught to eat grain at least by late in the summer so that when weaned they will be able to go on a ration of grain and hay without any set-back. They should have all the grain they want together with plenty of good hay through the first winter and in fact until the time when they are sold, with a possible exception of a short period during the second spring when the grass is especially good. Most breeders of pure-bred cattle prefer a fall to a spring calf. If the cows are given reasonable shelter and good feed, they will milk well all winter and the calves will thrive, and when grass comes the calves are just at the age when the spring calves would be weaned, but the fall calves do not ha

to be taken from their mothers so early. Instead, the mothers are turned out on good grass, which stimulates the milk flow, and the calves, therefore, get an abundant supply of milk for several months. They also will learn to eat grass and by the time they are nine or ten months old, they may be weaned without the least set-back. They should, like the spring calves, be taught to eat grain before they are separated from their mothers, and should have grain from this time on through the winter until the next spring, when they will be ready to sell. The advantages of fall calves are: first, they secure much more milk and for a longer time and so make bigger calves at less expense; second, they may be sold at about six months' less age than the spring calves. Purchasers of bulls to go on beef herds want to buy them in the spring and they want bulls old enough to go into service. A fall calf can be ready for this market at the age of eighteen months, whereas the spring calf has to be kept to an age of about twenty-four months. Of course the spring calf at twenty-four months is a bigger, more mature bull than the fall calf at eighteen, but the fall calf at eighteen is big enough for service and that is all the beef-man wants or is willing to pay for. The chief objection to fall calves is that cows are sometimes harder to breed in the fall. Some of the larger range-men prefer to buy their bulls as calves just weaned and grow them out themselves. Their reason for doing this is twofold: they obtain the first pick of the calves in the breeder's herd, and they can grow them out just the way they want them. This is, of course, a very satisfactory method of doing business. The smaller beef-producers, however, do not do this but put off buying bulls until it is necessary to have them, which means that they must purchase a bull old enough for

service. In all the large auction sales for pure-bred cattle the best age for the bulls is about eighteen months. Some few are sold at the age of twelve months, but unless they are exceptionally growthy and fat, they go at a considerable discount.

MARKING

Pure-bred cattle do not ordinarily require branding in order to establish the ownership, as in the case of commercial cattle, but it is necessary to give each animal some number or other identification mark in order that an accurate record may be kept of the breeding. There are two common methods of marking pure-bred cattle. One is to put a small button or metal in the ear. This tag bears the initials of the owner and the number of that particular animal. The other method is to tattoo the number in the ear. The latter method is by far the most permanent, but the marks are difficult to read except at very close range. In addition to these methods some breeders brand the number on the horns. In this case, if the horn is broken off the number is lost. Such a number is very easily read, and some of the breeders put the tattoo mark in the ear in order to have a permanent mark, and then also put the same number on the horn so as to have a mark that is easily read. On account of its absolute permanence, the tattoo is recommended by most breed associations, and, whenever possible, the tattoo number should appear on the certificate of registration.

MARKETING

The surplus from the pure-bred herd may be marketed by public auction, or by private sale. An auction of pure-bred cattle, in order to attract any considerable number

of buyers, should offer at least fifty and preferably seventy-five or eighty head of good cattle. The larger breeders often put on auctions of their own cattle where they have enough to justify it. In other cases breeders' associations, either the national Shorthorn or Hereford associations or local organizations, put on combination sales in which many breeders will consign their cattle. For small breeders located at some distance from the beef-producing centers, the latter method of sale is very desirable, as it enables them to secure as good prices as the larger man and cuts down materially the cost of advertising, which on a small herd is a heavy burden. Regardless of the class of cattle or location, advertising is always essential to the success of a pure-bred herd. By advertising is meant advertising in the broader sense of making one's product known to the public. Whether this be through word of mouth, reputation of the herd, a record of the show rings, high prices obtained at sales, or through newspaper advertising, the effect is the same. It makes the herd known and talked about among persons who may be purchasers. The various fairs and stock shows, ranging from county fairs to the Chicago International, are big factors in the pure-bred cattle business. They enable the breeders to come together and compare stock and thus better their judgment. They also accomplish much to advertise the stock of exhibitors among the other breeders and with the public at large. For a breeder who is ambitious to have the reputation of producing only the best, there is no advertising so effective as a record of successful winnings at the fairs. A man who wins an important prize at the state fair not only wins a small money consideration, but obtains free advertising which would cost him many dollars if secured through the ad-

vertising columns, and which furthermore reaches more persons and is much more effective. A regular advertisement, however, in the farm press must not be overlooked, and the successful breeder must constantly keep his name before the public through this means. There is much art in successful newspaper advertising and the young breeder should study carefully the various papers which might be used as a medium for advertising purposes. It is also well to consult with the older more experienced breeders and find out what papers and what kind of advertising they have found brings the best results. It is sometimes possible for a small breeder of a rather cheap grade of cattle to sell considerable of his surplus with very little advertising, provided he is located in the heart of the range district and has a wide personal acquaintance with the beef-producers. It is rarely possible, however, by this means to reach any more than a local market and as soon as the neighbors are supplied with bulls, the breeder finds himself without an outlet for his stock. The problem of selling is one that no breeder can long neglect.

PART III

SHEEP

By Oran M. Nelson

CHAPTER IX

WOOL AND MUTTON PRODUCERS OF THE WEST

THE sheep of the West, because of geographical and climatic conditions, are divided into two great classes: range sheep and farm sheep. Farm sheep in the West are handled in a manner similar to that followed in the eastern states, in England and in Europe, making, of course, necessary allowance for differences in feed, climate, and peculiarities of the people. Nothing similar to the western range sheep industry is to be found elsewhere in America or Europe. It resembles more closely the sheep business of Australia and Argentina, but even there the resemblance is largely confined to the immense size of the flocks and the preponderance of Merino blood.

RANGE SHEEP

The range sheep industry resolves itself into three phases: the raising of range sheep for wool and mutton; the raising of pure-bred sheep on the range; and the fattening of range lambs in the winter time.

The essential features of raising of sheep for wool and mutton on the ranges are as follows: extensive use is made of rough range land not suitable for cultivation, such range usually being public domain, either within or without Forest Reserve; the sheep are handled on a

large scale and are seldom kept under fence; the raising of sheep on the ranges is a business in itself, and is not ordinarily conducted in connection with, or as a by-product of, any other line of agriculture.

The raising of pure-bred sheep on the range is very similar to that of raising commercial sheep for wool or mutton. The essential differences come in marketing and in the fact that the pure-bred stock, because of the capital invested in them, require better care.

The fattening of range sheep on grain and hay is a business confined strictly to those districts where alfalfa is abundant. It is conducted exclusively in the winter time, and is usually carried on in connection with either raising sheep on the range or the raising of hay and grain on the farm. Of the three phases, the first is, from the standpoint of capital invested and number of persons employed, by far the most important.

FARM SHEEP

The three phases of the farm sheep industry are: the raising of spring lambs, the raising of pure-bred sheep, and the raising of hot house lambs.

The raising of spring lambs on the cultivated farms of the West is a business that is conducted on a small scale in connection with other forms of general grain and hay farming. The flock usually consists of twenty to two hundred head. These sheep are never herded but are always under fence and for the most part on cultivated land. Some native pasture is used, but not a large amount. The sheep are mostly grades of the down or long-wooled breeds.

The raising of pure-bred sheep on the farm is very

similar to that of raising spring lambs. The essential difference is in the time and manner of marketing. The lambs have to be held over until the fall, and sometimes are past a year before they are placed on the market. When sold, they go largely for breeding purposes.

The raising of hot house or winter lambs is the raising of baby mutton to be marketed in December, January, or February. Such lambs are raised in small lots in certain parts of the West. This phase of the sheep industry is of but minor importance and could be easily over-done.

In any discussion of sheep raising of the West, it is absolutely necessary to keep these different phases distinctly in mind, for facts which apply to one branch of the industry may have no application to another.

CHAPTER X

RANGE SHEEP

THE natural conditions and environment in the western states, and the extensive scale on which the sheep industry is conducted, together with the high price of labor and the comparative inaccessibility of some of the larger sheep ranges, have rendered it necessary to develop a system of management which is comparatively uniform throughout the range districts, although certain minor differences prevail in various localities on account of climatic, labor and transportation conditions.

HERDING

The great western ranges, unlike other sheep countries, are absolutely devoid of sheep fences. Consequently, the sheep must be herded every day of the year except when they are shut in the feed-lots in the winter. At evening, they are brought in close to the herder's camp where they lie down during the night. Next morning, they are out grazing early and the herder must be up to keep watch of them. The herder is assisted by a camp tender who moves camp and brings out supplies. One camp tender may in some cases tend more than one herder. The heavy expense of herding range sheep makes it necessary to give each man as many sheep as he can take care of, which will be 2000 to 3000 wethers or 1000 to 1500

ewes not counting their lambs. This in turn necessitates the use of sheep carrying a considerable portion of Merino blood, since it is only from this source that sheep derive that peculiar tendency to "flock" or stay together, which makes it possible for one man to handle so many.

The herders are never called shepherds, but always "herders" or "sheep-herders." The word "shepherd" is used in the West only to indicate the man who takes care of a flock of pure-bred sheep on the breeding farm or on the show circuit. The word "flock" is also supplanted on the range by the word "band." "Flock" is considered correct usage only when applied to a small bunch of sheep kept under fence.

SUMMER AND WINTER RANGES

The summer range is located in the higher altitudes where the high plateaus, burns, and mountain meadows furnish green grass during the months when the lower ranges would be very dry. Green grass is very necessary during the months of June, July, and August in order to maintain the milk flow at a maximum. At the age of two months, lambs require green feed even more than do the ewes. The exact time the sheep enter the summer ranges depends on the season and the locality, but it is usually during the months of May or June and after shearing. The sheep are kept upon the summer range as long as the weather permits, which is until there is danger of blockade from early snow storms. Usually the sheepmen drive their sheep out of the mountains before any signs of deep snow appear rather than take the chance of a severe loss. In a favorable season, when the weather is good and the feed abundant, there is a strong tempta-

tion to leave sheep in the mountains after the time when snow storms may possibly come. This policy is successful part of the time, but occasionally entire bands are lost from an unexpected storm, and in severe cases the herder will be fortunate if he escapes with his own life. Most of the sheep are brought out of the mountains in September and October.

The location of the winter range is determined by its proximity to haystacks or the ranch house. Where the snowfall is heavy, it is necessary that the winter range be located close to covered corrals and haystacks. The winter ranges are for the most part located on the lower hills, plateaus, and prairies, where the snowfall is comparatively light, especially as compared with the mountains. In the lower lands the atmosphere is usually fairly dry and there is a considerable wind, so that even when there is a comparatively heavy snowfall, the wind will leave a great many bare places. While all of these ranges are designated as "winter" ranges, it must be understood that to call them spring and fall ranges would give a more adequate idea of their real use unless it be in parts of New Mexico, Arizona, or Nevada. Most of these ranges afford grazing for one to three months earlier in the spring than do the typical summer ranges and in addition they afford a like amount of good grazing during the fall after the danger of early storms has made it necessary to take the sheep out of the mountains. During the winter, most of the winter ranges amount to very little. It is very true that when the grass is allowed to obtain a good growth during the summer, it cures down in the fall and makes a very nutritious feed at such times in the winter that it is not covered with snow. On account of the present scarcity of range land of this kind, it is almost

impossible to save very much grass for strictly winter use; but they may afford a little feed which together with sage-brush and other shrubs will carry the sheep through the winter with but a limited amount of hay.

THE BREEDING BAND

The ewe band on the range is usually grade Merino, although the type and general character of the breeding band varies with the motive of the owner. If he is a wool-producer his ewes tend toward the long-stapled dense-fleeced kinds and the sires are usually of one of the long-wool breeds. In case he specializes in fat lambs, his ewes are of the heavier blockier sort and his rams of one of the mutton breeds. In one case fleece is the principal product and in the other the lambs are considered more important. In either case one cannot be profitably produced without the other. In other words, the breeding band is in all cases dual-purpose.

The sires used on the range are mostly pure-bred. Grade sires are not very successful as they are not able to stamp their type on their offspring as uniformly as pure-bred sires. The sire, no matter what breed he belongs to or whether his rôle is mutton or wool production, must have a strong constitution, well-formed feet, and straight legs with strong bone. His mouth must be sound and his head must have the masculinity that goes with the normal male. Some breeders lay special emphasis on the latter point, believing that a ram lacking in this feature will not be able to stamp his characteristics on his lambs. Rams used on the range are purchased in carload lots, usually from dealers for $15.00 to $35.00 per head.

While the rams may be of any breed, the ewes must always carry some Merino blood in order that they may have the hardiness and flocking qualities necessary for range use. One quarter Merino ewes give fair satisfaction but the half blood is most popular and brings the highest price. The ewe, like the ram, must have a strong constitution, strong back, and good feet and straight legs with plenty of bone. She should be at least a yearling and not over a six-year old and have a sound mouth. To breed ewes younger than one year tends to diminish their size, while ewes older than six too often have broken mouths. Ewes' mouths begin to break at about six years and sometimes before. It is better to fatten them and sell for mutton just before they break. All ewes that have proven to be non-breeders or poor mothers should be taken out before breeding begins, since they are worth more as mutton than as breeding stock. It is customary for the range-men to go over their flocks every fall and cut out all ewes that are no longer fit for breeding purposes. If taken before their teeth are gone, they can be fattened into good mutton, but if their teeth are broken, they will not fatten and must be sold as "cull ewes" for whatever they will bring. Some men mark at lambing time all the ewes that are poor mothers or which do not bring lambs. By fall they will be fat and can be sold for mutton. A popular way of marking such ewes is to cut off the end of the ear.

DETERMINING AGE

The age of sheep is determined by the order of appearance of the permanent incisor teeth. The sheep has eight permanent incisors which supplant the milk teeth

in regular order. The permanent incisors are considerably larger than the milk teeth and are somewhat broader in shape. The first pair of permanent incisors appears in the center of the mouth when the sheep is about twelve months old. The next pair appears, one on each side of the first pair, the following year. The third pair appears when the animal is three years old and the fourth pair when it is between four and five years old. This method of determining the age of a sheep is quite reliable, although feeding may cause a little variation in the time at which the permanent teeth appear.

BREEDING

Breeding on the range usually occurs somewhere between October first and December first. The exact time depends on the spring climatic conditions. As the gestation period of ewes is about five months, breeding should begin five months before the lambs are wanted. The rams are turned in with the ewe band at the rate of about one ram to forty ewes. They are left sufficient time that all the ewes are bred, which is usually from sixty to ninety days.

WINTER MANAGEMENT

Sheep-men estimate the cost of wintering, including labor, from 50 cents to $1.00 a head. It is generally considered that the price of the wool will easily pay for the cost of wintering. At the present time, practically no sheep-men attempt to run their sheep through the winter without hay. The amount allowed varies considerably, but usually runs from seventy-five to two hundred pounds a head. One hundred fifty pounds a head would doubtless be more nearly the usual average. Very little grain is

fed to range sheep, although it has been found that at times when feed is very scarce and it becomes necessary to ship or haul the feed for considerable distance, grain is more economical than hay on account of the ease with which it may be handled. Especially is this true where it is necessary to haul the feed for several miles out into the range. If the sheep have sage-brush to nibble on with an occasional bite of grass, one-fourth pound of grain a day will help greatly in pulling them through a bad winter. In some of the range districts on the eastern slopes of the Rocky Mountains, the sheep-men purchase corn in carload lots and hold it as insurance against short feed. In other localities, cotton-seed cake and linseed cake are used. The nut size cake is used the most as it can be fed on the ground. It is given at the rate of four or five ounces a head a day. In some localities it is necessary to keep the ewes up and feed in corrals a great part of the winter. In such cases, alfalfa hay is used. The cost of wintering in this system is somewhat greater than where some grazing is available.

LAMBING

The proper time for lambing is the earliest time of the year that climate and feeding conditions will permit. Lambs should not come before the green grass starts in the spring, since green grass is quite essential to a maximum milk flow. The possibility of late storms is also an important consideration, especially in the higher altitudes. The actual date of lambing varies somewhat according to local conditions and according to the amount of hay and feed room which the owner may have. The larger part of the range lambs in the Northwest are dropped

between March first and May first and in the Southwest somewhat earlier.

At lambing time, a number of extra men must be hired. During the other seasons of the year from 1500 to 3000 sheep are handled in one band, but during the lambing season each one of the larger bands must be divided into a number of smaller ones. As far as possible, the older and more experienced herders are put in charge of the lambing pens, and the owners and managers in this season of the year are obliged to give the flocks the closest personal attention. There are two principal methods of lambing: namely, the open range and the lambing shed or tent.

Lambing on the open range.

Lambing on the open range differs from that in the shed primarily in that the sheep are herded on the range during the day and corralled at night. In different localities lambing on the open range varies somewhat, but the following may be taken as a fair example. At lambing time a night herder is placed in charge of the band. As soon as the lamb is born, it and its mother are removed from the corral and placed in a lambing pen and kept there until maternal relationships are well established. A lambing pen is a pen just large enough for a ewe and her lamb. Some sheep-men vary the above procedure by bedding the drop bands just outside the corrals. The lambs which are born during the night are, under this system, not disturbed unless something is radically wrong. The next morning the ewes which have no lambs move away from the bedding ground leaving the ewes and their young lambs behind. When the ewes have been bedded outside, this separation is comparatively natural

and is effected without disturbing lambs to any great extent. After the newly born lambs and their mothers have been separated out, those lambs which do not seem to be properly owned are put with their mothers in the lambing pen, while the others are worked out on to the range to graze. This system requires much less work than where the ewes are corralled at night, but is probably not quite so effective.

During the daytime an extra herder follows the lambing band and the young lambs and their mothers are separated from the main band, generally known as the "drop" band, and are gathered together in small bunches of ten to thirty head. As soon as a small bunch of ewes with their newly born lambs are gathered together, they are left behind and a tall stake with a flag erected in order to show their location. The ewes and their lambs will not stray far from this place for the first twenty-four hours. During the course of the day several of these bands are separated out. They are not usually moved the first night but left out on the range where they are and the herder camps with them. Special precautions are sometimes necessary to keep off wild animals. A lantern may be hung on a stake to keep away the coyotes, or the herder may fire off guns or fire crackers from time to time. The next morning these small bunches of newly born lambs are brought together and put with other ewes and young lambs to form what is known as the infant herd.

A simple piece of equipment that has not yet been used to a great extent on the range but which is growing in popularity is a lambing blanket. This blanket is simply a piece of canvas lined with soft cotton cloth. The canvas is fifteen inches wide and sixteen inches long with

a small part cut out for the neck. A string is looped in each corner on the lower end of the blanket through which the hind legs of the lamb are put. On each side of the front of the blanket a string is fastened to be tied across the lamb's chest. The use of the blanket is limited to stormy weather. In lambing on the open range many lambs are lost because of cold rains or snows that occur in the first few hours of the lamb's life. If it is storming at the time the lamb is dropped, one of these blankets is placed on the lamb and left from two to five hours as the occasion may require. Care has to be exercised in its use as the blanket may tend to cause some ewes to disown their lambs.

When the range is level, a lambing wagon is often used. This wagon has a broad, flat-bottomed rack, which is divided into about twenty-one small pens, each barely large enough to hold the ewe and lamb. Each pen is so arranged that it opens toward the back. This wagon goes out on the range every morning. As each ewe lambs, she and her lamb are placed in one of these pens. As soon as the wagon is full, it returns to the corral where the ewes and lambs are placed in the care of an experienced shepherd. Here the ewes with young lambs are banded together into an infant herd, much the same as when the wagon is not used. At first, there are about 100 in each infant band, but as the lambs grow older the smaller bands are put together, thus gradually increasing the herd until at the end of about ten or fifteen days there will be 1200 or 1500 ewes with their lambs in each band. The lamb bands are from this time on driven greater distances from the home ranch, but are not usually moved to the summer range until they are a month or six weeks old. Ewes with their new born lambs are kept

in small bunches at first so that the lamb and ewe may not become separated. A ewe separated from her lamb for a period of twenty-four hours, loses its scent and consequently disowns it. In such a case not only is the lamb lost, but the ewe's udder may become spoiled. All lambs which are disowned or whose mothers have died are known as "bums." They are usually given over to some ewe that has lost her lamb; this failing, they must be taken to the ranch house and brought up on bottles, or else allowed to die. Wherever there is any difficulty in making the ewe own the lamb, the ewe is put in an individual lambing pen along with the lamb and left there for such time as may be necessary. When this treatment fails, other or additional measures may be adopted; for instance, the ewe may be fastened in a stanchion made by driving two stakes in the ground about four inches apart at the bottom and fastened together at the top with a small rope or wire. Rubbing some of the ewe's milk on the lamb will also assist, since the ewe recognizes her lamb entirely by scent, and not by sight, sound, or touch. When a ewe is expected to own a lamb not her own, as when her own lamb has died, it is a very common practice to take the skin of the dead lamb and fasten it over the back of the other lamb. In no case should the skin be left on the adopted lamb longer than twenty-four to forty-eight hours. If the ewe and lamb are kept in a small pen, no further difficulty will be experienced.

The tendency of ewes to disown the lambs is partly dependent on the natural disposition of the ewes and partly on the feed and treatment which they have received. Ewes that are thin and badly run down at lambing time will not own their lambs as readily as those that are in better condition. Hard late winters are usually

followed by increased difficulties at lambing time. These same conditions, of course, also affect the milk flow, and it has been found that the willingness of the ewe to own the lamb is almost directly proportional to the abundance of her milk.

Lambing sheds and tents.

The use of the lambing shed or tent is the newer method of lambing and its success has brought it into great favor with the sheep-men. The systems of management for the shed and tent are similar and, therefore, the shed alone will be discussed. The lambing shed, which is not an expensive structure, is so arranged that the ewe and lamb after lambing are kept inside and fed until the ewe comes well into milk and maternal relationships have become well established. When the lambing shed is used, the sheep do not roam over the open range but are usually inclosed in a yard adjacent to the shed. The band of ewes is watched very closely night and day, and as soon as a ewe lambs she and her offspring are removed to a place in the lambing shed. There are at present several types of lambing sheds used on the range and they all have their merits and faults. However, there are two types that stand out as being more perfect than the others and because of this, a short discussion of each will be given.

The general procedure in the type of shed illustrated in Fig. 11 is as follows. If the lamb is dropped during the night, the ewe and the lamb are placed by themselves in one of the small pens in part of the shed marked B. Here they are left until daybreak, at which time they are removed. If the ewe had only one lamb and has owned it, she is placed in pen 1. Each ewe which lambs during

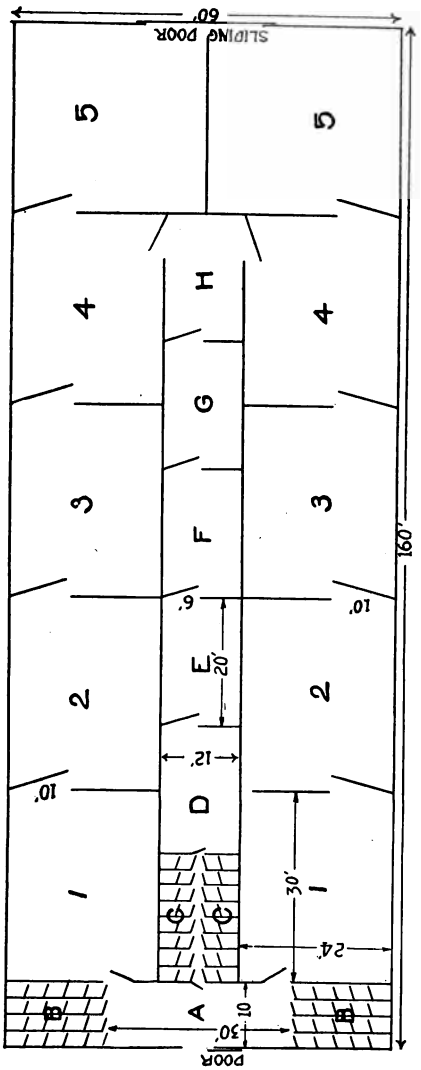


FIG. 11. — Floor Plan of a Lambing Shed.

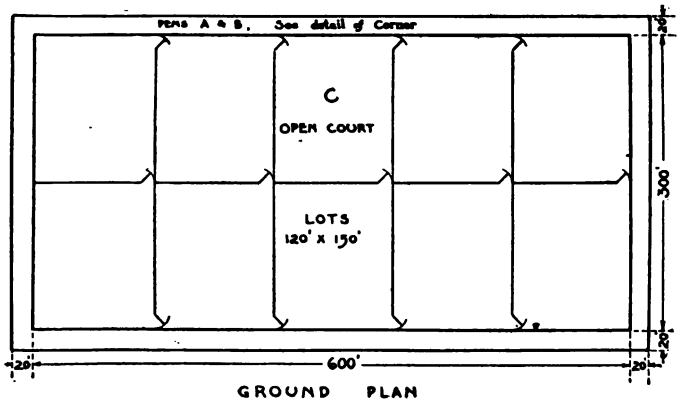
the day is placed in pen A until she has cleaned, and has given indications of owning or disowning the lamb. As soon as this is accomplished, she is placed in pen 1, or one of the lambing pens marked C, depending on her attitude toward the lamb and on whether she had singles, twins, or triplets. If she had a single and properly owns it, she goes into pen 1. Thus by night, pen 1 contains ewes with their lambs that were dropped during the preceding twenty-four hours. The next morning this bunch of ewes is moved to pen 2, so as to leave pen 1 vacant for a fresh lot of ewes. Every morning this bunch of ewes is moved until on the fifth day they are in pen 5. On the morning of the sixth day they are ready to leave the shed and go to the adjacent range. All ewes that are stubborn and all ewes having twins, instead of being placed in pen 1 are placed in one of the lambing pens marked C, where they are left until there is no doubt as to relationship between the ewe and the lamb. As soon as the proper maternal relationships have been established, the ewe with her lamb or lambs is placed in pen lettered D. Each succeeding day she is moved to the next pen, going from pen D to E, from pen E to F, and F to G, and from G to H, and pen H to 4, from pen 4 to 5, and from pen 5 to the outside. By this arrangement all stubborn ewes and ewes having twins are kept inside seven days after they own their lambs, and all ewes having singles and owning them are kept inside the shed for five days. At the particular shed illustrated, the lambs are dropped at the rate of eighty every twenty-four hours during the busy season. Five men do the work. One is a night-drop picker, one a day-drop picker, and three are shed-men. The duty of the night-drop picker is to watch the band at night and as soon as a lamb is born he puts the lamb and its mother

in one of the night lambing pens marked B. The duties of the day-drop picker are similar to those of the night-drop picker, but instead of placing the ewe and lamb in one of the lambing pens marked B, he places them in pen A. The duties of the shed-men are to care for all ewes that enter the shed, shift them to their proper pens, and give such special attention as may be necessary.

The system of management with the other type of shed may be outlined as follows: Whenever a ewe drops a lamb, she and her lamb are moved by means of a sled to the nearest opening in the shed. They are immediately placed in one of the individual pens marked A. Here they are kept for twenty-four hours. If proper maternal relationships are well established at this time, they are moved across the alley into one of the larger open pens marked B with several other ewes and their lambs. Here they are kept for three to six days depending on the strength of the lamb. From pens B they go into the yards marked C. These pens are large enough to hold about 200–250 head of ewes and their lambs. In these large pens the ewes remain until grass comes, at which time the bands are made up for the range.

In both the types of lambing sheds, it is necessary to feed the ewes as they lamb before grass is good. A very common feed is chopped alfalfa hay. Often a little grain is fed to insure a good milk flow. All pens in lambing sheds must be well supplied with running water.

The system of lambing in the shed has several distinct advantages, which can be enumerated as follows: first, a great saving of labor; second, a larger percentage of lambs; third, less orphans and dead lambs result; fourth, better and stronger lambs, as the ewes cared for in this manner give more milk.



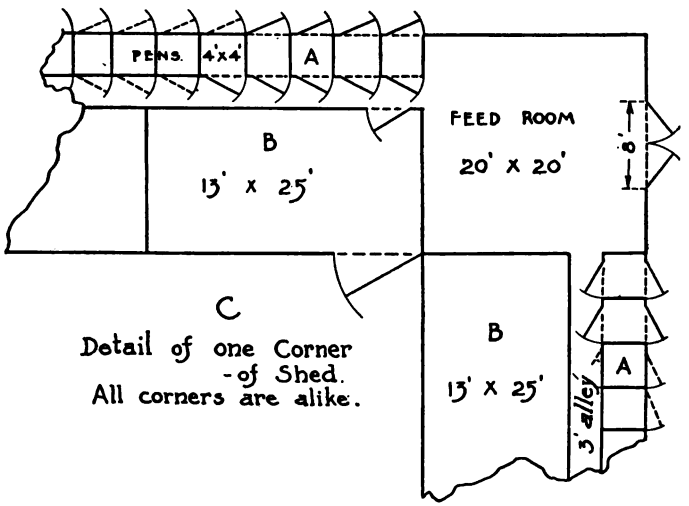


FIG. 12. — Floor Plan of Open Court Lambing Shed.

All lambing systems, whether shed, tent, or corral, have two purposes: first, to prevent ewes and their lambs from becoming separated until the lambs are old enough that there is no danger of their being disowned; second, in those cases in which lambs are unavoidably disowned, to remedy the difficulty by some special means. Minor, although important, considerations in lambing are to prevent lambs from becoming chilled or trampled to death and to assist ewes that have difficulty in parturition. The large size of the range flocks makes the dangers of lambing many times greater than with small farm flocks, hence the system of lambing on the range is always elaborate and painstaking.

PERCENTAGE INCREASE

The percentage of increase varies with the climatic conditions, and with the care given. Severe weather tends to decrease the percentage while good care tends to raise it. The percentage usually varies from about 50 to 100; that is, there are 50 to 100 lambs for each 100 ewes. The average in the western states is between 80 and 85 per cent. A percentage higher than 100 is not to be desired, since not many of our ranges are good enough to support ewes bearing twins and one good strong lamb is better than two weak ones, neither of which may live through the summer. The percentage increase is usually calculated on the basis of the number of lambs and ewes counted at the time of marking.

MARKING

The term marking is used on the range to designate the operations of docking, castration, and branding lambs.

These three operations are usually performed at the same time rather than at separate times as is the case on the small farms. The method of castrating and docking is the same as that used on the farms and a detailed discussion of these operations is given in the chapter devoted to farm sheep.

SHEARING

The time of shearing is usually shortly after lambing if weather conditions permit. On the ranges, nearly all of the shearing is performed sometime during the months of April, May, and June.

The work is usually conducted by professional shearers who travel from one locality to another. Because of the large experience which these men have, they are able to shear 100 or 200 sheep in a day. Some of them shear in Australia, New Zealand, and Argentina as well as in the United States and in this way have work almost the year around. Within the past ten or fifteen years, machine shearing is largely taking the place of hand work. The machine shears are usually arranged in gangs of ten to forty machines all run by one engine. The chief advantages of machine shearing are: a neater job and less cutting of the skin. An expert can shear about as many by hand as by machine, but an amateur can work much faster with a machine. It was at first feared that the very close shearing performed by the machine might subject the sheep to damage when exposed to the burning sun or storms; but so far, few bad results from these sources have been noticed. In many states a large amount of shearing is still done by hand, but the use of the machine is growing. The process of shearing large flocks occupies considerable time under the most favorable conditions,

and since the sheep spend most of this time with very little feed, it is necessary to work with the greatest possible speed. On this account the sheep-men are partial to the large plants that can shear an entire band in one day.

DIPPING

Dipping for ticks is an operation which should follow shearing. Both lambs and mature sheep must be dipped. The method of dipping is to run the sheep through a long vat or tank which contains a solution of dip. The tank on the range usually is long enough so that it takes about two minutes for the sheep to swim through.

The directions sent along with the dip recommend dipping twice, nine to ten days apart. The life cycle of the tick, however, indicates that it would be better to make the time about twenty-one days. The first dipping kills all ticks on the animal at that time but has no effect on the pupæ. The second dipping kills the ticks that have hatched since the first dipping. There are many dips on the market at the present time, all of which fall into two general classes, namely, dips which kill by poisoning, and dips which kill by burning. Arsenical dips would fall in the first class, while dips such as Kreso No. 1, Zenoleum, Chloroleum, Lysol, and Creolin and Lime-sulfur make up the second class. There is considerable controversy between the producers of dips as to the relative merits of these two classes. One claims that the class which kills by burning damages the wool, while the other sets forth the damages resulting from the sheep swallowing some of the poisonous dips. Tests have been carried on at various experiment stations to determine the relative merits of these dips. It appears from these

tests that all of the standard dips are effective in killing the ticks but the effect on the wool has not yet been demonstrated with sufficient certainty to justify any positive statements at this time.

Dipping for scab, although the method of dipping is the same as that for ticks, is quite another problem. This is performed only when the disease is present or when the band has been exposed. Such dipping should be done at once under the directions of a competent man. When allowed to spread, sheep scab causes a great financial loss. These losses are caused by a decrease in production of wool, loss in weight and general condition of animals, and the death of large numbers of sheep. While this disease is severe and highly contagious, it yields readily to proper treatment. The state live-stock sanitary boards or the United States Bureau of Animal Industry usually take charge of the dipping for scab and all cases should be reported at once to the state or federal authorities. Lime and sulfur, nicotin, coal-tar-creosote and cresylic-acid are dips commonly used for scab. Dipping for scab is usually done twice at intervals of ten to fourteen days. The entire band should be dipped regardless of number bearing symptoms of the disease. The temperature of the bath should be 100° to 105° F. for lime and sulfur and nicotin dips and about 95° F. for the coal-tar-creosote and cresylic-acid dips. The sheep should be held in the dip for two to three minutes if the disease is not too advanced and three to five minutes in bad cases. The sheep at dipping should have no cuts or sores, especially if lime and sulfur is used, as blood poisons may result. For this reason dogs that bite the sheep should be kept out of the corrals.

Often some weak sheep may get dip in its lungs or be

almost drowned in spite of care exercised. Such a sheep can be saved by remòving it from the vat and swinging it around in a circle holding it by the hind legs. The centrifugal force developed in this way removes the dip from the lungs and the sheep soon recovers.

In dipping for ticks or scab, one should remember that there are two methods of procedure. One way is according to directions, and the other is to attempt to economize time, labor, or money by using weaker solutions than advised and by hurrying the sheep through the swim. If the former method is used with any of the standard dips, the treatment should result in a cure. If the latter method is adopted, failure to effect a permanent cure is sure to result, regardless of dip used. It is a loss of time and money to dip sheep unless the work is properly performed.

BRANDING

After shearing, the sheep are usually branded with paint marks so that they can be distinguished from other owners' sheep. Common paint is generally used, but brands so made cannot be removed by the usual process of scouring, so the manufacturer must cut off the brands with the shears at a cost of much labor and considerable loss of wool. A trial of brands at one of the western stations showed that of those in common use, Kemp's Australian Branding Fluid scoured out best, but with this fluid it is necessary to brand twice. The expense of branding twice a year, however, is less than the loss occasioned by the use of common paint brands.

SUMMER MANAGEMENT

In summer the herder with the assistance of the camp tender moves the sheep to the higher mountains or sum-

mer ranges. In some localities a camp wagon is used. These wagons are complete with cover, bed, stoves, and other equipment and can, therefore, be moved with little trouble. Most of the summer ranges, however, are too rough for the use of wagons, so the camps must be moved with pack horses. The herder is in charge of the sheep at all times, and during the day drives them out for a distance of two or three miles and at night works them back to the camp. As soon as the grazing becomes short, the camp is moved for some distance and the sheep are maintained about the new camp as a center for a similar length of time. The moving of the camp is usually conducted by the camp tender, who also looks after bringing in the supplies, and the like. In some districts, one camp tender will look after several camps, but in most places, on account of the roughness and inaccessibility of much of the range, one tender is employed for each camp. Sheep do better and waste less grass when the camps are moved frequently, hence with the present scarce range and high-priced sheep, more camp tenders are used and camps moved more often than formerly. In the case of small sheep-men who own only one or two bands, the owner often tends to the camp, but depends on hired help for herding.

CARE OF THE RANGE

Best results are obtained when sheep on the winter and summer ranges are allowed to graze in open formation. Considerable damage to the range results when shepherds use the closed formation of grazing. Not only is this latter method of grazing detrimental to the range but it is also hard on the sheep. Only those sheep grazing around the edges get the amount of feed that they should.

Those in the center are forced to eat the less choice forage left by other sheep. Often they have to eat down to the roots. Danger from poisonous plants is also greatly increased. Many of the best sheep-men, realizing the danger of close formation grazing, give orders to their herders to give their sheep considerable liberty. In this way the range is kept in good condition from year to year and the sheep receive the best grazing possible. The Forest Service now demands that sheep on the Reserves be grazed in the open formation as far as possible.

WATERING

The frequency with which sheep must be watered depends on the succulence of the feed. When the forage is rank and green, sheep may run for many days without water, but when it is very dry, water will be required at least every day. The summer ranges are for the most part well watered with springs and small streams so that there is no difficulty encountered in giving the sheep water at least every day. There are, however, considerable areas of range land where there is very little water. These ranges are for the most part too dry for use as summer sheep range even if water were abundant, so no attempt is made to use them except in the winter, when the sheep depend on snow instead of water. In some localities the sheep-men have provided ponds, wells, or other artificial water systems for these drier districts but these cannot be erected on government land.

SALT

Some men furnish their sheep salt at all times, either giving at regular intervals or keeping salt before them.

PLATE IV. — OPEN AND CLOSE HERDING.

Much less range is required where the sheep are grazed in open formation as above instead of being closely bunched as below.

On the other hand, some may not give any salt at all and claim they secure better results by allowing the sheep to find alkali licks than by supplying them salt. Where the alkali licks are abundant, and when this alkali contains as much as 85 per cent common salt, it must be considered as entirely satisfactory, but where the alkali is not very abundant or when it is composed largely of carbonate of soda, sulfate of soda, or Epsom salts, it cannot satisfactorily take the place of artificial salt.

WEANING

The lambs are ordinarily weaned at the time when they are brought off the summer range. The lambs are separated and taken some distance away from the ewes. The process of weaning is simple, as at this time the ewes are not giving a large quantity of milk and consequently the lambs are not very dependent.

MARKETING MUTTON STOCK

Mutton lambs are either marketed at weaning or are placed in the feed-lot and sold ninety to one hundred days after being placed on feed. Big breeders usually divide their lambs into three lots; one lot consists of ewe lambs which are to be kept for breeding purposes; the second, lambs which are fat enough to ship direct to market; while the third lot consists of those lambs which are too thin to go for mutton and which must be put into the feed-lot. In addition, there is sometimes a fourth lot consisting of wether lambs which are to be held over and run as yearlings the next summer. This fourth division is growing constantly smaller and in practically all cases consists only of those wether lambs which show no evi-

dence of mutton blood. Straight Merino wethers usually fall in this class. Mutton lambs are consigned in carload lots to commission firms at the stock yards, who sell them to the buyers of various meat companies.

MARKETING PURE-BRED STOCK

The general practice in the case of pure-bred stock is to hold them over a year and market them as yearlings. A few are marketed as lambs but this is not the usual practice. Pure-bred stock is offered for sale either by private treaty, private auction, or public auction. In the first method, the buyers come singly to the ranch and dicker with the owner. Arrangements as to price, payment, and delivery are made which are more or less satisfactory to both parties. Private auctions are held only in cases in which a party has large numbers of sheep to sell. Public auctions are usually held under the auspices of some organization such as the National Wool Growers, the Breed Associations, and the like. A certain percentage to cover expenses of the sale is charged on all stock sold. Auction sales, whether private or public, have advantages to both the buyer and the seller. The buyer has a large number to select from and has a chance to secure just what he wants. The seller has a fairly good chance to obtain a good price for his stock. Competitive bidding tends to run prices up. This is particularly true of good stock.

CALENDAR OF OPERATIONS ON THE RANGE

In the following calendar, the time will be given by season and the operations will be named in the order in which they are performed:

CALENDAR OF OPERATIONS

TIME	OPERATIONS
Fall	Return of flocks from summer range, division of flocks, selling of lambs, dipping if infested with ticks, and breeding.
Winter . . .	Winter feeding if range is not sufficient.
Spring . . .	Lambing, marking, shearing, dipping, branding, entrance on the summer range.
Summer . .	Herding on the summer range.

LOSS FROM WILD ANIMALS

The loss from wild animals is always a serious problem in the raising of sheep on the range. The cougar, bob-cat, mountain lion, bear, and coyotes all come in for their share of the sheep-man's profit. Some prominent sheep-men estimate the losses from wild animals at about 10 per cent per annum for the entire West. This figure may be too high, but the loss is enormous at the most conservative estimate. No successful method has yet been found to check this loss. It is kept down to the lowest point by constantly guarding the sheep, especially at lambing time, when the herders make a practice of hanging out lanterns, and firing off guns and fire crackers. Some attempt is also made to shoot the coyotes. The only place where this problem has been fully solved is in Australia, where in certain parts of the country entire range districts are surrounded by high wire fences. Fencing has been tried by the Forest Service of this country with good success. Not only is the loss from wild animals

practically eliminated with the use of high wire fences, but the expenses of handling sheep are greatly lessened. To what extent fencing will be practiced in this country cannot be foretold, but it is the general opinion among the best informed range-men that, since the most tillable land has been put under cultivation, the next step will be the fencing of those parts suitable only for grazing. There are so far three great obstacles in the way of extensive fencing. The first is the cost, the second is the drifting snow over these fences in the winter, and the third is that most of the grazing land is not under private ownership.

COSTS AND PROFITS OF A RANGE EWE

Based on figures gathered in 1914, the cost and profit on a range ewe can be taken as follows:

Costs			
Interest on ewe at 8 per cent	$.40		
Shearing, packing, and marketing wool	.15		
Depreciation [1]	.42		
150 lb. of hay at ½¢ a pound	.75		
Loss on ewes by death	.10		
Cost of range (summer and winter range)	.50		
Labor aside from lambing	.80		
Extra labor for lambing	.32		
Upkeep, depreciation, and interest on camp tender's outfit	.10		
Total cost		$3.54	
Income			
10 pounds wool @ .15	1.50		
1 lamb	3.50		
Total income		5.00	
Profit a head			$1.46

[1] The yearly depreciation on a ewe was figured as follows: The average price of a yearling breeding ewe was $5.00. Her period of usefulness would be six seasons, after which she could

CAPITAL REQUIRED

The capital invested in a sheep ranch must necessarily vary within very wide limits. A band is the unit of management and necessarily the business cannot be conducted with less than this number. A very good start can be made with 1500 ewes, while with wethers a larger number would be needed. The minimum capital required to start in the business might be estimated as follows:

1500 ewes, at $5.00 a head	$7,500
Horses, wagons, and general camp equipment	1,000
Home ranch capable of raising winter feed for 1500 ewes	5,000
Total	$13,500

This represents about the minimum capital with which the business can be started, but of course a considerable part of this $13,500 may be borrowed. The cost of the home ranch is the most variable factor. In the early days no land at all was necessary, but at the present time it is very difficult to succeed without at least some land. The price given would usually purchase a ranch that would furnish hay for 1500 ewes. A larger area would, perhaps, in addition to furnishing the necessary amount of hay, give considerable winter and summer range. As a rule, however, ranches handling only one band of sheep will seldom cost more than $10,000 to $12,000.

When large numbers of sheep are raised, the capital invested is much in the same proportion, although perhaps hardly as great as with the small outfits. By far the larger number of sheep-men, however, are running only one band.

be sold for $2.50. This would make a total depreciation of $2.50, which would amount to about 42 cents a year.

BUILDINGS

A considerable proportion of the sheep-men use no buildings, although in such cases they commonly have protected localities where the sheep may be fed in the worst storms and where there is a certain amount of protection during the lambing season. In the more unprotected localities and in those regions where an effort is made to have the lambs come early, large sheds are required. These will usually be very low, but will cover a considerable area and are of the cheapest possible construction. A common method of construction is to drive stakes in the ground for posts, putting poles across the top as a framework and covering them with brush. Another popular building material is corrugated sheet iron. Since the hay is usually stacked in the field and hauled to the sheep, the sheds have no provision for the storage of hay. The inside of these sheds is perfectly plain, but with the aid of a number of board panels and the numerous posts supporting the roof, the shed can be divided into many small pens suitable for lambing purposes. Most of these sheds are approximately square in shape, and are inclosed on all sides. In some localities where all the bad winds are from one direction, the sheds are long and narrow and open on the unexposed side, but in regions of severe climate the closed shed is usually preferred.

CORRALS

Corrals are used to a greater or less extent on all sheep ranches. Some sheep-men make a practice of having cheap corrals scattered about the ranch, keeping sheep in them at night, but this is not the usual practice and is

not permitted in the Forest Reserve. It is customary, however, to have corrals within at least a reasonable distance so that in case bands of sheep become mixed, it is possible to corral them for separation. At the home ranch, corrals are always used to some extent at lambing time. In addition, the better equipped sheep ranches all have corrals equipped with a dodging chute. This is a long narrow chute through which the sheep may pass one at a time. At the end of the chute is a small gate so arranged that the sheep may be run into either one of two corrals by simply moving the gate. In separating sheep, men will be stationed along the chute to pick out the ones which go into a certain pen. These will be marked usually with blue chalk. Then, after they reach the end of the chute, the man working the gate lets the marked sheep into one pen and the remainder into the other. In this way a large flock of sheep may be divided into several parts, with great rapidity. In picking out ewes which are to be sold on account of broken mouths or spoiled udders, this system is very commonly used. A number of corrals are always necessary in connection with dipping vats and shearing plants.

The most common method of corral construction is by means of light panels of boards. These are wired together at the ends and either put zigzag or are supported by wiring or nailing to stakes driven in the ground. Woven wire also makes good corrals, especially for temporary use. Thirty rods of woven wire fencing will corral a large band of sheep, yet this amount of fencing will only weigh 200 pounds.

CHAPTER XI

FATTENING RANGE LAMBS IN WINTER

THE fattening of range lambs in winter has become an important industry in the irrigated sections of the West where good hay and grain are abundant. Since both hay and grain are required for the best results, lambs cannot be fattened profitably where either one is lacking or excessively high in price. A comparatively dry climate is also very helpful. Where there are a great many wet storms, sheds and barns are necessary and cost of maintenance and interest on the investment in such barns take off a large part of the profit.

THE LAMBS

The lambs used for winter fattening are those that are brought in from the range in the fall or early winter and that have not had good enough grass during the summer to make them fat. When the range is extra good, lambs will become fat and attain weights of seventy-five to eighty pounds before fall and are thus suitable to go directly to market. When the range is not so good, the lambs will not be fat, and will weigh approximately sixty pounds each when they come off the range in the fall. Such lambs, while rather small and lacking in flesh, are in most cases very strong and vigorous, and when put on full feed make rapid gains. When fat, moreover,

they sell at top prices, even though they may look somewhat leggy and rough. Range lambs that are born very late in the season and that perhaps have had very poor feed, come off the range in the fall weighing forty to fifty pounds each. Such lambs are usually known on the market as "pewees" or "peanuts," and sell for rather a low price. These lambs are not desirable for mutton purposes of course, and are badly in need of more weight and finish, but they are usually rather delicate and too light to be profitable feeders. Unless they are known to be fairly thrifty, and the feeder has an abundance of rich feed, they had better be let alone. Generally speaking, the ideal feeder is the thrifty fleshy range lamb, weighing sixty pounds in October or November. The more mutton blood which these lambs carry, the better. Lambs with heavy wrinkled pelts are objectionable, as they do not gain rapidly and sell to a disadvantage. The black-faced lambs are preferred, as the black faces are an indication of Shropshire, Hampshire, or Oxford blood.

LENGTH OF FEEDING PERIOD

The time lambs are ordinarily kept on full feed in winter is about ninety to one hundred days. This period varies very little in the different feeding sections. A shorter period than this commonly does not put on sufficient gain to pay a profit, while a longer feeding period is unnecessary, as good lambs will be sufficiently fat in one hundred days to bring the top price. There are a number of large feeders in the West, however, that do not feed for any regular length of time. These men buy sheep of all kinds, sell the fat ones for mutton, and put the others in the feed-lot. These sheep that go into the feed

will necessarily vary considerably in condition, and some will be ready for market long before the others. The feeder will therefore go through the bunch a number of times during the winter and top out the best to send to market. Handled in this manner, some of the sheep will not remain on feed over thirty days, while others will remain on feed as much as three or four months.

FEEDS AND RATION

Corn is perhaps the best grain for feeding lambs, but it is not available in the lamb-fattening districts of the West except eastern Colorado. In this particular district the lambs are all fed alfalfa hay raised on the farms, together with corn shipped in from Kansas and Nebraska. The finest lambs produced in America come from this section. In other states, oats, barley, bran, and screenings are commonly used. Screenings are variable in their cost and in their value, but in most cases will produce just as rapid gains as barley, though requiring larger quantities. When a lamb would be fed one pound of grain a day, he would be given perhaps one and one-fourth to two pounds a day when screenings are used. If the screenings are very chaffy, as much as three pounds a day are sometimes fed. In this case, no hay is used, since the chaff and cob in the screenings afford the necessary roughage.

While alfalfa is most popular, clover hay, free from weeds or other grass, and well cured, will give equal results. Prairie hays and wild hays of various sorts are seldom used, and in practically no case do they give the same satisfaction as alfalfa. The Wyoming Experiment Station has made a long series of tests of alfalfa in com-

parison with prairie and wild hays, and they have found that with the wild hays so much more grain was required for one hundred pounds gain that the cost of this grain was equal to the cost of both grain and hay where the alfalfa was used. It is evident, therefore, that it does not pay to use this kind of hay at all when alfalfa can be obtained at a reasonable price.

Near the sugar-beet factories, considerable quantities of beet pulp are fed. This pulp is given in quantities somewhat less than the lambs will consume, together with hay and grain in the usual manner. Since beet pulp is largely water, it must be bought at a low price and must be fed in the vicinity of the sugar-beet factories. Dried beet pulp can be fed at a greater distance from the factory than the wet beet pulp, but has so far been but little used for lamb feeding.

The standard daily ration for lambs weighing 60 pounds at the start would be about two-and-one-half to three pounds a head of good alfalfa hay. This would, of course, be all that they could be made to eat, with the stems and waste parts cleaned out and fed to other stock. After the lambs have been in the feed-lot for perhaps a week, and are thoroughly accustomed to their surroundings, a small amount of grain is given, usually about one-fifth to one-fourth pound a day a head. The grain is then slowly increased until they are receiving one to one-and-a-half pounds a day.

A grain ration of one to one-and-a-half pounds of grain is called a full ration. In many cases this amount is not reached until practically the end of the feeding period, the ration being gradually increased through the entire time. The lambs still receive all the hay they will eat, but with a full ration of grain they will not usually eat over

one-and-a-half to two pounds of hay. A system of feeding lambs that is very often found in feed-lots where the ninety days' feeding period is used could be outlined as follows:

	Grain Daily a Head	Hay Daily a Head
First 30 days . . .	½ pound	2½ pounds
Second 30 days . . .	1 pound	2 pounds
Third 30 days . . .	1½ pounds	1½ pounds

After he is on full feed, a thrifty lamb will eat close to two pounds of grain a day, but in the West it is not customary to give quite all he wants. As a rule the alfalfa is of fine quality and rather cheap, while the grain is very expensive, hence the necessity for economy in the feeding. Remarkably heavy gains are often obtained with good alfalfa and only one pound of grain a head and it is very doubtful whether a larger amount of grain is a profitable investment. It will be noticed that the increase of grain ration is greater in the first and second periods than in the second and third periods. Great care has to be exercised in increasing the ration toward the close of the feeding period as lambs go off feed easily at this time.

METHOD OF FEEDING

It is essential in fattening lambs that the grain and hay be fed in such a manner that fresh hay can be put in and stems and refuse taken out without interfering with the lambs. The method most widely used is to have the lambs fed through a fence made of panels so that the hay can be put on one side while the lambs are on the

PLATE V. — WESTERN LAMB FATTENING.

Above, arrangement of racks; center, detail construction below, typical feeder lambs.

other. These panels are ordinarily made out of six-inch fence boards with about seven-inch space between each board. The load of hay is driven along the outside of these fences and the hay thrown off on the ground. Afterward it is pushed up to the fence so the sheep can reach it. When hay and grain are fed in the same troughs, the wagon drives around in the same manner as when the hay and the grain are placed in the feed troughs without disturbing the lambs. In such feed yards, the wagon never goes inside the lot with the sheep. Very commonly the fence is built in a zigzag, instead of straight line. This gives the lambs more feeding room on the same ground. In feed-lots where the grain and hay are fed in separate troughs, the hay is fed through panels as described above, while the grain is fed in long narrow troughs built so that they stand about a foot from the ground and have a bar along the top to keep the lambs from jumping into them. When these grain troughs are used, it is essential that these be in a separate pen and that the feed be put in before letting in the lambs. Otherwise, it will be impossible to distribute the grain so that each lamb will receive his share. To accomplish this, feed-lots are often built in a series of long narrow pens, fenced with zigzag panels. When large numbers of lambs are fed, it will require several pens with one extra vacant pen. In feeding grain, the feed is placed in the troughs of the vacant pen first and the lambs turned in from pen no. 2. The grain is then put in no. 2 and the lambs from no. 3 put in that pen and so on until all are fed. At the next feeding, the pens are taken in the reverse order. To attempt to feed by driving teams into the lot with the lambs is only to make trouble.

The practice of cutting alfalfa hay for lambs is grow-

ing rapidly throughout the West. The alfalfa is run through a cutter that chops it up in lengths of about three-fourths of an inch. After being cut, the hay may be fed direct, stored in barns, or stacked in the fields. Some feeders make a practice of stacking their hay in the field at haying time and then during the late summer or early fall go into the field with a big chopper and traction engine, chop the hay, and restack it in the field. This chopped hay stacks well and the stacks are said to turn moisture as well as those made from the long hay. Grinding alfalfa is practiced to some extent, but this process requires much more power than chopping and seems to be little improvement. There are many large establishments that make a business of grinding hay, but these firms ship out their product and usually sell it under fancy names to the dairymen and small farmers.

The chief advantages of chopping are ease of handling and freedom from waste. When long hay is used, it is always necessary to clean out the stalks and leavings, since the lambs will not eat these until they become very hungry. When the feeder has a considerable amount of stock, sheep, cattle, or horses, this refuse may be fed to advantage, but where he has no outlet for refuse hay, it is a dead loss. With the chopped hay, however, the entire amount is consumed without waste or loss. Another advantage is that the grain is mixed with the chopped hay. In this manner lambs that are not used to this grain may be put on full feed in the shortest time and with the least danger. It is not usually claimed that chopping or grinding hay has any great effect on its digestibility or feeding value; that is, the professional lamb-feeders who are handling it on a large scale do not make such claims, although firms grinding it and selling it under

fancy names go so far as to claim, in some cases, that the ground hay is fully equal to, if not better than, the common grains.

Grain for sheep does not need to be ground, cooked, or treated in any way. There is no class of animals better able to grind its own grain than sheep. There is a possible exception to this rule, however, in the case of old ewes with bad teeth.

SHEARING FOR FEED-LOT

In regions where the winter climate is not too severe, the practice of shearing sheep for the feed-lot is more or less common. The object of shearing is to increase the gain, the idea being that shorn lambs will thrive better and have better appetites. There is usually no profit to be obtained on the operation of shearing itself. Shorn sheep are docked to such a degree as to account for all possible profit. A few figures gathered in the range district will prove this contention. On an average, 100 pounds of lamb will yield eight pounds of wool, which will bring 18 cents in the grease.

8 pounds of wool @ 18¢	$1.44
Cost of shearing and marketing this 8 pounds wool	.15
Net income from wool	$1.29

Were this wool marketed on the sheep's back, it would bring at mutton prices 7 cents a pound, or 56 cents. This leaves a net difference of 73 cents in favor of marketing the wool off the sheep's back. However, the dock on shorn sheep is usually $1.00 a 100 pounds. In this case, the dock more than accounts for the profit which might arise from shearing. These figures were gathered in 1914. Since that time prices of mutton and wool have

both risen. By inserting current prices, a feeder can soon figure whether he will derive any profit on shearing itself or whether he will have to depend on the increased gains only for his returns from shearing lambs for the feed-lot.

Shearing is especially popular among speculators near the large markets. These men find that shearing saves room in the feed-lots, which in their case is often an important item, as shorn sheep may be sorted without handling. They usually handle immense numbers of sheep of all grades and are constantly sorting them over to procure those which may be turned at a profit. When the sheep are shorn, a glance will tell the condition of each animal.

SHELTER

The ideal feed-lot should be located in a place sheltered by nature from the prevailing winds and storms, and should have a small stream for the water supply. In such localities sheds are hardly necessary. In fact, very few lambs are fattened under shelter. When the feed-lots are in exposed positions, simple sheds of rough boards may be necessary. These will be used only for shelter in times of storm, and the hay racks and grain boxes will all be out in the open. There is a growing preference among feeders for pumped water instead of running streams. It is claimed that the warmer well-water is better for the lambs than the ice cold stream. It is possible, however, that the advantage is due to the well-water being given in convenient troughs where the lambs can get it easily, while the running stream often has such steep icy banks that the lambs will not drink until their thirst becomes unbearable.

DIPPING

It is becoming a very common practice to dip all sheep before putting them in the feed-lot. The chief purpose of this is to rid them of ticks. If allowed to run out on the open range in winter, the sheep are not usually seriously troubled with ticks, but if they are crowded together in the feed-lots, especially if under shelter, the ticks multiply with the greatest rapidity, and in a few weeks there are millions of them. On this account many of the most progressive sheep-men make a practice of dipping all sheep before putting them in the feed-lot.

GAINS

Lambs fed as outlined above may be expected to gain from .2 to .3 pound a day, an average of one-fourth of a pound. This would mean a gain of twenty-five pounds a head in 100 days. Gains of less than twenty pounds during this period are unsatisfactory, as the lambs are growing rather than becoming fat. Gains of over thirty pounds are extraordinary and are obtained only with well-bred mutton lambs and very choice feed. If the lamb weighs sixty pounds at the start and gains twenty-five pounds during the feeding period, he will then weigh eighty-five pounds, which will be an ideal weight for a fat lamb. The buyers like to have the lambs as small as they can be procured, providing they are sufficiently fat. About eighty-five pounds is considered the best weight, since a lamb can easily be made fat at that weight and make it unnecessary to hold him until he becomes much larger, while, on the other hand, lambs lighter than eighty pounds are rarely very fat.

COST AND PROFIT

From the following figures gathered prior to opening of the European War, one can obtain an idea as to the costs and profits of feeding lambs. These figures are based on a lamb as a unit. A lamb fed as outlined in the discussion of feeds and ration would, during a ninety-day feeding period, consume eighty-five pounds of grain and 180 pounds of hay and during this time would gain about twenty-two-and-one-half to twenty-five pounds:

Costs:	
60 pounds lamb @ .05	$3.00
Interest on $3.00 for 90 days @ 8 per cent	.06
85 pounds grain @ $1.25	1.06
180 pounds of hay @ $7.00	.63
Loss by death	.05
Commission	.05
Yardage	.05
Freight	.20
Incidentals	.05
	$5.15
Income:	
82½ pounds lamb @ .07	$5.775

Deducting the cost from the income would leave a net profit a head of $.625. The feeding margin in this case is $.02, being the difference between the buying and selling price a pound. As the various items listed above are more or less variable, the profit a head increases and decreases from year to year.

FEEDING WETHERS

Wethers are fattened in the same way as lambs, although not on so large a scale. They will require on the average about 40 per cent more feed, a larger portion of which may be hay. In spite of this larger feed, the daily gain is about

the same as for lambs, or possibly a little less. The cost of feeding, therefore, will be about 40 per cent greater, and the margin required correspondingly increased. For these reasons, there is not usually the profit in feeding wethers that there is in feeding lambs unless the margin is very large.

FEEDING OLD EWES

Large numbers of old ewes are sold in the stock-yards every fall at low prices, and in many cases offer attractive opportunities to the sheep-feeder. It is very essential, however, that these old sheep have good teeth. A large part of these old ewes are put on the market because their teeth are bad and they are no longer profitable on the range. Such ewes will not pay for feeding. In fact, they commonly will not become fat at all and all of the feed put into them will be wasted. On the other hand, however, if the teeth are fairly good, they may often be profitable. Sometimes the teeth are too bad to allow the ewes to be kept on the range, but are still good enough so that they will fatten when put on good feed. In general, fattening old ewes is rather risky, and such ewes should not be bought for feeding purposes without a very careful examination. The rations required for ewes are about the same as for wethers, though in some cases slightly less. Grinding the grain for ewes will sometimes pay, but not usually. The gains will vary from nothing to one-fourth pound a day, and the cost is usually somewhat higher than with wethers.

CHAPTER XII

CROSS-BREEDING FOR WOOL AND MUTTON PRODUCTION

ONE of the most difficult problems which confronts the range-man is the maintenance of his cross-bred breeding stock. It has long been known that the combination of the Merino with long-wooled or mutton breeds is the best and most profitable one for the range when it is desired to improve the mutton qualities without sacrificing wool production. The Merino blood furnishes the fineness of wool fiber and the flocking propensity so essential on the range, while the long-wooled breeds lengthen the wool staple and improve the mutton conformation. This type of ewe is easily obtained by crossing long-wool rams, such as the Lincoln, on Merino ewes. A more difficult problem is holding the cross after having produced it. These cross-bred ewes mated to a fine wool ram produce offspring more nearly resembling the Merino, while mated to a Lincoln ram, much of the Merino quality disappears. By mating back and forth, using sires ranging from the Merino to the long-wool, a great variety of types more or less profitable are produced and in time the flock becomes a mixture of all kinds and types and even some of the individual fleeces show much variation in different parts. With this zigzag method of breeding the ewe stock is constantly deteriorating, and the fleeces becoming more

and more irregular. The fleece of a straight cross-bred sheep is quite uniform throughout and each fiber is a blend as to length and fineness between the long-wool and the Merino. Such fleeces are very popular on the market and are suitable to many forms of manufacture. If, however, the ewe is of this zigzag breeding, the fleece of the offspring will not be a good blend but will be mixed, some fibers fine and some coarse, thus making the wool unsuitable to the manufacture of many of the standard grades of cloth. Many a range-man has experienced these difficulties, and after years of careful breeding and the constant use of pure-bred rams has realized that his stock had deteriorated and is no longer producing profitable fleeces. This difficulty must be met in one of two ways. One is to breed cross-bred ewes to cross-bred rams and continue the process with careful selection until there is evolved a new breed carrying the type of the original cross-bred but breeding true. This is being attempted in the case of the Corriedale and Panama. The second is to adopt some system of cross-breeding which will hold off deterioration as long as possible and thus give the breeder the maximum returns from the cross-bred flock before he has to turn the ewes for mutton and start anew.

THE CORRIEDALE

The Corriedale is an established breed, the type having become fixed by years of careful breeding and selection in New Zealand. The original stock was obtained by crossing Lincoln rams on Merino ewes. Later a little Leicester blood was introduced to make the lambs mature earlier. All this was years ago and since that time no outside blood has been introduced and selection has been

extremely rigid. The Corriedale is very similar to the Lincoln-Merino cross which is so common on our ranges, with the addition that they breed reasonably true. Pure-bred Corriedale ewes are out of the question for range purposes, but if cross-bred ewes are carefully selected and mated to good Corriedale rams, the offspring will be as profitable as the ordinary half-bred and much of the same type. By moderate but careful culling and the continued use of Corriedale rams, the type of the ewe flock should become well established in a few years. This system has not been tried on an extensive scale in this country, but it has proven very successful in New Zealand. The great difficulty is in securing Corriedale rams. Being a comparatively new breed, rams are not numerous, and those available require close culling.

THE PANAMA

The Panama breed of sheep was developed in America from a cross-bred origin somewhat the same as the Corriedale. The type of this breed is not well fixed as yet, but with years of breeding, involving careful selection and culling, it will undoubtedly be a factor in western sheep-breeding.

SYSTEMATIC CROSS-BREEDING

In view of the relative scarcity of sheep of these new breeds that possess the type really desired by the rangemen, it seems necessary to continue some form of cross-breeding. Although cross-breeding always has its faults and its difficulties, it has been demonstrated that there are better methods than the indiscriminate mixing commonly followed on the range. The best system of cross-breeding yet devised is illustrated by the diagram

(Fig. 13). The first mating consists of pure-bred long-wooled rams and pure-bred Merino ewes. This cross

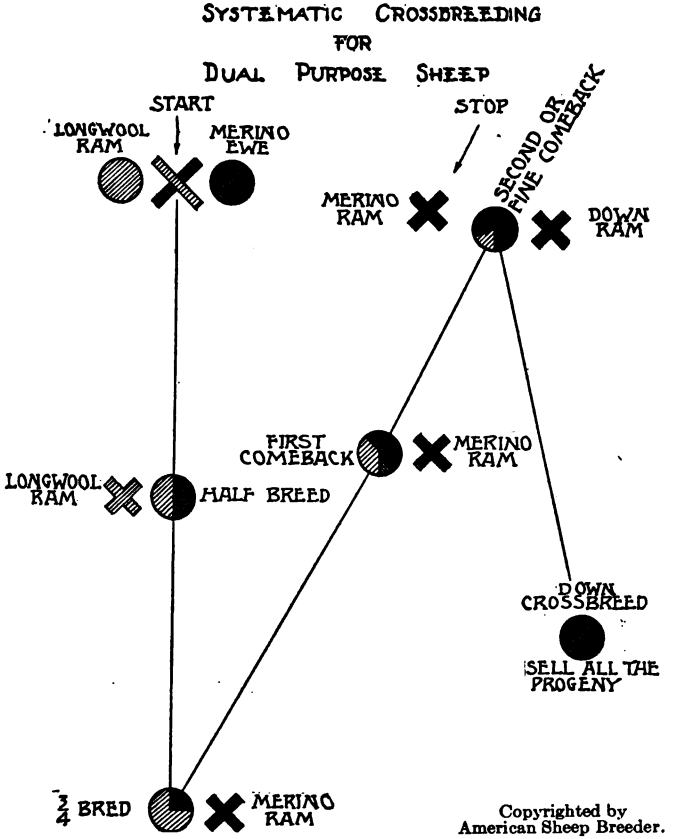


FIG. 13.

produces a type of ewe known as a half-bred. The ewe offspring of this first cross mated to a long-wooled ram gives

a sheep known as the three-quarter-bred. The three-quarter-bred ewe has a coarser fleece than the half-bred but somewhat finer than the long-wooled ram. These ewes are, therefore, mated to a Merino ram. The offspring of this mating is known as the first come-back and has a fleece of a finer staple than the regular half-bred. The first come-back mated to a pure-bred Merino ram produces the fine or second come-back, a sheep which closely approaches the Merino. The process ends at this point and the fine come-back ewe is bred to a good mutton ram and the progeny all sold for mutton, none of the ewe lambs being retained for breeding purposes.

One might at first think that this ewe would serve for a long-wooled cross again, but as a result of her mixed breeding her offspring will be very irregular and continued zigzag breeding will finally result in a run-out stock. It is an established fact that one cannot repeat this cross-breeding process and be successful. On the contrary, it is necessary to go back to pure-bred Merino stock every few years, and experience has shown that the fine come-back is as far as the cross-breeding can be profitably continued and that deterioration is very rapid after this point is passed. The system described is not used to a great extent in this country, but during the last few years has attracted considerable attention on account of its success in Australia and New Zealand. An objection raised to it by the range-men is that a breeder would have to have several bands and that one man would not be able to handle it. This objection hardly holds, since it is only during the breeding season that separation is necessary. A man not sufficiently experienced to tell the ewes of various stages could use the following system of identification. Pure-bred Merino ewes, the half-bred ewes, and the

three-quarter-bred ewes can easily be distinguished by their appearance and would need no marking. The first come-back may be marked by cutting a notch at the end of the right ear; the fine or second come-back with a notch in the left ear; and the offspring of the fine or second come-back with notches in both ears. If the sheep are marked by the lamber at birth there will be no danger of mistakes. It is a simple matter to herd all the sheep together during the year and divide the band into two or three bands during the breeding season, depending on whether the breeder wishes his mutton stock sired by a medium-wooled or a long-wooled ram. If he preferred the latter, then his pure-bred Merino ewes, half-bred ewes, and second come-back would all run in one breeding band with long-wooled rams; and his three-quarter-bred ewes and first come-back ewes, in another breeding band with pure-bred Merino rams. If he preferred the former, he would have to maintain a separate breeding flock for his fine come-back ewes, which would be mated with medium-wool rams.

This system permits of as many steps in the process of cross-breeding as is possible and still produce the most profitable sheep for range conditions. The ewes of these five classes produce wool of a very high character and uniform from year to year. The male lambs of the first four classes and the entire progeny of the fifth class sell satisfactorily as mutton lambs. In this way the band would be producing both wool and mutton of the very best type, and the greatest possible value would have been obtained from the original start of Merino ewes.

CHAPTER XIII

FARM SHEEP

RAISING sheep on the farms is usually a very profitable branch of the live-stock industry. It is adapted to any climatic condition, requires little capital or skill, builds up the soil, fits in with the most approved rotation, and is not very likely to be over-done. It is not at present very highly developed except in western Oregon and Washington where nearly every farm has a few sheep.

Among the farms suitable for the raising of sheep may be included practically all of the general hay and grain farms of the West. The farms where grains, clover, vetch, and rape are grown are the best for this purpose. Especially is this industry suitable for those farms which have had their fertility exhausted by continuous grain cropping. Sheep-raising requires about the same kind of a farm as dairying, but facilities for marketing are not so important and more grass land can be used. As compared with dairying, sheep-raising requires more land and capital, but is not as laborious and confining. The ideal sheep farm will include much rolling, well-drained land that will stand much tramping. Such land can be pastured the year round. Of course, this is a good type of land for any purpose, but it is especially good for sheep.

No expensive buildings are needed. If one has room to store his hay, necessary sheds may be constructed at a

very small expense. A shed eighteen feet wide and sixty feet long, closed on three sides, may be erected at a cost of about $30 to $35 for the material. Such a shed will provide ample protection for about forty or fifty ewes but of course will not provide storage room for hay and feed. In regions where climatic conditions are very severe, it might be necessary to have a sheep barn, but such a barn can be erected at a very reasonable figure and yet be very serviceable. A more detailed discussion of barns will be found on page 194.

THE FLOCK

Establishing a flock.

In establishing a flock, it is better for a farmer to start on a small scale unless he has previously had experience with sheep. A mistake in management or an error in judgment is not of so great importance when only a few are involved and experience is thus obtained at the minimum risk and expense. Sheep, although they do not interfere materially with the regular farm operations, do have peculiarities which at times require immediate attention. One cannot turn them off by themselves and expect them to thrive and do well. Such things as falling on their backs in dead furrows, foot-rot, and similar troubles, will cause serious loss if not given immediate attention. By raising the sheep himself, instead of buying them all, the farmer may obtain a more uniform flock and one that would be better adapted to his conditions, besides getting them cheaper.

Grade flock.

A grade flock is required where the production of market stock is the sole aim. Grade sheep are inferior to pure-

breds in every way but in the important points of abundance and cheapness. Not over one or two per cent of the sheep in America are pure-bred, hence it is impossible to obtain pure-bred ewes to produce the mutton and wool needed. The few pure-bred ewes obtainable are too high-priced to be used for commercial mutton and wool production, and, except the culls, are of much more use to the country when used for raising good rams for grading up our common flocks. The question of whether to raise grades or pure-breds is not, therefore, one of the relative merits of grades or pure-breds, but a question of whether one is to raise mutton and wool for the usual market channels, or to raise breeding rams and ewes for other sheepmen. While for the production of commercial mutton and wool, grade ewes are a necessity, the ram should in all cases be pure-bred. The grade ewes vary in quality, depending on the judgment that has been exercised in their selection and the extent to which they have graded up from common stock by the use of pure-bred sires. As a rule, the better ewes are the most profitable investment, since ewes that have not been bred up to the point where they are reasonably well suited to the purpose in hand can seldom be purchased at their true value. After the flock has been established, it may be constantly improved by the continued use of good sires so that altogether there is no reason why the breeder of grades should not have a strictly high-class flock. Ewes carrying considerable Merino blood are usually hardy good mothers, and heavy shearers, and, therefore, very good for farm use except in western Washington and Oregon where the winter climate is ill-suited to the tight Merino fleeces. The long open fleeces of the Cotswold or Lincolns are better suited to the warm winter rains of this region, as they drain and dry off

better. The middle wools are also good, but need more protection from the rains. Any of the mutton breeds may be used successfully in the dry parts of the West, since the flocking qualities of the Merino are of no advantage on the farm. Regardless of breed, the fleeces must receive careful attention, since the wool from the ewes should bring in nearly as much money as the lambs.

Pure-bred flock.

Since the increase from the pure-bred flock is to be sold as breeding stock, it is fundamental that the foundation stock be enough better in breeding and individuality than the average stock of the country that their offspring will be capable of effecting a marked improvement when used to grade up the common stock. Not all pure-bred sheep of any breed are sufficiently desirable and those that are not should be sold for mutton and not continued in the breeding flock. In establishing a pure-bred flock, only first-class stock is worthy of consideration. It is also desirable to buy from a well-known breeder, since one is more sure of what he is procuring and, furthermore, will give the new flock a good reputation at the start. Reputation, it must be remembered, is very important when one comes to sell his increase.

It should be borne in mind that the breeding flock is by no means a show flock. The best breeders usually keep their breeding ewes in the background and place their show stock in the barn where it can be seen by buyers and visitors. A good breeding ewe, which is working every year carrying one, two, or three lambs and successfully nursing them during the period of infancy, is sure to lose some of her uniformity of body lines and wool covering in a few years, and will not present the handsome ap-

pearance she had earlier in life. Because of this, the flock of breeding ewes cannot have the fine appearance of show sheep, a fact to bear in mind in buying foundation stock.

There are many good breeds from which selection can be made. The best returns are from the standard breeds for which there is a well-established market. Rams are bought in large quantities, hence the larger the number on hand and the larger the number of breeders in the neighborhood, the better the sales. Cotswolds, therefore, sell better in a Cotswold neighborhood and Shropshires in a Shropshire neighborhood. The small breeder should not attempt to introduce a new or unknown breed. That is a business for the man with a thorough knowledge of the sheep trade and strong financial backing. On the other hand, temporary waves of popularity need not be followed too closely. Such breeds as the Rambouillet, Cotswold, Lincoln, Shropshire, and Hampshire are standard in spite of their temporary booms and depressions, and a good, well-managed flock of any of these breeds is always a practical business investment, and one of especial appeal to the farmer who has developed a liking for sheep together with a knowledge of their ways and who desires to devote his entire time to the business.

The ram.

There is a saying that if a ram is a good one he is half the flock, and if he is a poor one, he is all of it. This statement may be somewhat overdrawn, but nevertheless it does carry much truth. Improvement in a flock can be brought about at less expense by the use of a good sire than in any other way. The best ram is the cheapest one in the end. The wise selection of a single ram has, in

many instances, made a flock famous. A ram, to be worthy of being the head of either a pure-bred or grade flock of ewes, must have considerable masculinity, or he is not likely to transmit his qualities to his offspring. No one can afford to use a ram that cannot easily be distinguished among a flock of ewes. The ram is expected to carry all of the characteristics of the breed which he represents, together with a good constitution as indicated by a large heart girth and a strong back, well formed feet, and straight legs with plenty of bone. The fleece should be typical of his breed and by all means uniform in density and length and fineness.

Prepotency is most essential. This is impossible to determine in the case of an untried ram, but is usually indicated by a good pedigree. In all cases, individuality must be combined with good breeding. Over-fitted rams are never desirable for breeding purposes and it is not usually wise to take one directly from the show circuit. Breeders often will make the statement that showing does not hurt breeding stock. This, of course, is true where the sheep are in the hands of a skillful shepherd. Few men, however, have sufficient skill to fit and to reduce show stock without materially damaging the breeding properties of the same. An exception should be made in the case of lambs, since it is almost impossible to get them too fat, while the fitting produces more growth than would otherwise be obtained. Unless the buyer is an experienced sheep-man, it pays better to purchase field sheep rather than show stock. By field sheep are meant sheep that are in normal condition, not having been fitted or pampered with the idea of showing.

Rams should be examined carefully to see that they have two testicles, and that they are free from goiter. A

ram to be a satisfactory breeder should be at least one year old before being used. Ram lambs may be used to a very limited extent but with the average breeder this is not advisable. However, when ram lambs are used they should be early lambs and well grown, and should not be allowed any more than about ten or fifteen ewes during the season. Ram lambs used excessively are very likely to become non-breeders later in life and thus the period of greatest usefulness would be lost. It is not advisable to give a yearling ram too free a run in the beginning. Two-year-old, three-year-old, and four-year-old rams need less attention. Possibly a two-year-old ram is the most satisfactory for breeding purposes, at least breeding records kept at various experiment stations indicate this. Often a breeder can purchase a tried ram and secure him very reasonably when the former owner wishes to dispose of him to prevent in-breeding. A ram of this kind very often proves to be a bargain. In selecting such a ram, one should be sure that his mouth is sound. In a small flock, one ram can be used for only two seasons. On a larger flock, where more than one ram is used, he can be kept a longer period without in-breeding.

The ewe.

With ewes, as with rams, the ideal form is desirable, but in the case of the ewes this is much harder to obtain than with the rams. The ewe's work of reproduction soon spoils the beautiful lines that she once had and for this reason one should not lay too much stress on the form to the exclusion of other qualities. The ewe, like the ram, should carry as much breed type as possible. Large roomy ewes, possessing a considerable degree of the dairy type, raise the best lambs. Very often the barren ewe presents

a superior mutton conformation. Ewes for breeding purposes must not be overly fat. The ewe that is patchy and seems to have a ledge of fat projecting out above the sex organ is objectionable, as it may be difficult or impossible for the ram to serve her. Femininity is as desirable in a ewe as masculinity is in a ram. It is an indication of refinement and should not be confused with indications of weakness. Ewes that are good mothers should be selected as far as possible. All stubborn ewes that have a tendency toward disowning their offspring or ewes that do not milk well are a source of considerable annoyance and the sooner they are removed from the breeding flock the better. There seems to be a direct correlation between the amount of milk and the degree of maternal relationship the ewe bears toward her young. When it is possible, the ewes should be selected on their past records and records of their ancestors. Investigations have shown that good breeding stock comes from good breeding stock. A ewe is not ready for breeding purposes until she is a yearling. Sheep ordinarily breed in the fall and drop their young five months later. This would make a ewe about a year and a half old at the time she is first bred, and two years old at the time she drops her lamb. The reason for not breeding sooner is that the strain of carrying a lamb is too great for a ewe until she has had her full development, and if bred young, may be stunted and never attain her full growth. It is usually preferable to buy ewes as yearlings, since the older ewes offered for sale are usually culls, unless the owner is disposing of his entire flock.

Flushing the ewes.

About a month or so before the breeding season begins the ewes are flushed. The term "flushing" means bring-

ing the ewes from a thin run-down condition to a strong, vigorous condition. Perhaps this can be brought about in no better way than by feeding good succulent feed such as rape, kale, or green clover. Of these rape is the best. The ewes are commonly kept on dry pastures during the summer months so that when put on this green rich feed, they gain very rapidly. The important point in "flushing" is that the ewes be gaining rapidly rather than that they be already fat. There are several advantages to be gained by flushing. First, if the ewe is in good vigorous condition she will be better able to withstand disease than if she goes into winter quarters in a thin condition. Second, the percentage of lambs is slightly increased, due to more vigorous condition of the ewe. Third, the ewes will breed more readily, thus shortening the lambing period.

Breeding season.

Before the breeding season begins the ewe flock is culled. All ewes that have not proved to be good producers or good mothers and all ewes with broken mouths or with spoiled udders and teats, are sold to the butcher. The work of culling is usually performed by the shepherd himself, as he knows the actual performance and condition of each ewe.

Most breeders tag the ewes before turning in the ram. This means clipping all surplus wool from the end of the tail and around the vulva. This aids the ram in mating, saves his vitality, and also insures less barren ewes in the flock.

The breeding season for most sheep is the fall of the year. The ewes are bred as early as possible, preferably during the months of September and October where climatic conditions in the early spring are not too severe. As

ewes carry their lambs five months, this will cause the lambs to arrive in the months of February and March, which is a good time in mild climate for either the commercial lamb or the pure-bred. Lambs earlier than this require extra care and expense, while later lambs do not have as good a start before the hot weather sets in.

Fifty ewes is the number usually allowed to one ram in a season. On many farms it is customary to turn the ram with the flock of ewes when breeding is to begin. This practice, though permissible, is not as satisfactory as the method where the ewes are bred by hand coupling. In hand coupling the ram is turned in with the ewes night and morning. At these times the flock is watched closely, and as soon as a ewe is served she is taken away so that the ram will pay attention to other ewes which may be in heat. The ram is not allowed to serve more than three ewes each morning and three each night. Some of the advantages of hand coupling may be enumerated as follows: the vitality and vigor of the ram is saved, as each ewe has one service instead of half a dozen; the ram is not allowed to give all his attention to one ewe, thus neglecting other ewes which might be in heat; the shepherd has a chance to find out whether or not his ram is a good breeder, as ewes which do not become pregnant from the first service will come in heat again; the shepherd is able to keep a record of the date of breeding of each ewe, and hence knows the date when she is to lamb. The disadvantages are additional labor and expense. For a choice pure-bred flock, hand coupling is usually advisable. It has also proven profitable when one wishes to breed more than the normal number of ewes to one especially good ram rather than to go to the expense of buying another ram which might not prove a satisfactory breeder.

Wintering ewes.

The ewes require a large amount of range in the winter and should not be closely confined in barns or muddy lots. Access to an open shed or barn under which they will be given hay and such grain as may be necessary is very satisfactory. Elaborate barns are not only unnecessary but are positively harmful. Some successful sheep farms use no sheds or barns, but in such cases they rely on natural shelter, as trees or brush and the like, where the sheep do not have to stand in mud.

It is impossible to give any exact rules for feeding during the winter. Sometimes when a few ewes are given the run of large fields and pastures, they will pick up enough feed to keep them. There will be found all intermediates between this condition and those in which ewes must be given all of their feed in the form of grain and hay. In the latter case the hay should be good legume hay. Timothy or cheat hay is poor feed for sheep and its use requires an excessive amount of grain. One ordinarily expects to feed a little grain when the ewes have no pasture. A mixture consisting of one-and-one-half parts oats to one part bran is a good feed for pregnant ewes. With ordinary hay, a daily ration of about one-half pound of the mixture for each ewe a day is sufficient, while with poor hay as much as one pound daily will be required. With good alfalfa or clover hay, no grain is needed until about a month before lambing. At this time it becomes necessary to feed a little grain or to increase the amount of hay to insure a good milk flow. One of the greatest difficulties of sheep-raising is the winter feeding of ewes. The shepherd either feeds them too well and does not exercise his ewes enough, or he goes to the other extreme and exposes them to storms with little or no feed. When

the ewes are fed heavily with little exercise, particularly if a large amount of bran is fed, the lambs, when they come, will be of such enormous size as to make lambing difficult, often causing the death of a number of ewes. When the ewes have been exposed in storms with little or no feed, they have no milk for the lambs and will not own them. Pregnant ewes must have enough food of the right nature to nourish the growing fœtus without stimulating too much development of the bone. A good rule is to use feeds fairly high in protein and mineral matter, and in sufficient quantities to keep the ewes in moderate condition, neither very fat nor very thin. Combined with this must be abundant exercise. Ewes must have good clean water, which can be reached without wading in the mud so deep that they will not drink until they are very thirsty. Sheep are so particular about mud that one must be very careful in this regard. When streams are used for water, conditions may often be improved by making an approach out of gravel or boards.

The attention given to the ewes at this season of the year must be constant. Turning ewes into a back pasture and never going near them is poor policy. They are subject to accidents which may seem trivial, but which kill many sheep. Of these, the most common is falling on their backs in a dead furrow where they remain helpless waiting for death or rescue. A successful shepherd early forms the habit of counting his sheep, in order that he may know when any are missing.

Wintering the ewe lambs.

Wintering the ewe lambs is essentially the same as wintering breeding ewes. When the flock is out on pasture and is receiving no grain or hay, the ewe lambs may

be run with the older ewes; but when grain is fed, the lambs must be kept separate, as the older ewes will crowd them away from the feeding troughs. Lambs require more feed than older ewes, instead of less.

Care of the ram.

The ram is usually kept away from the ewe flock except during the breeding season. If allowed to winter with the ewes, he is likely to bunt the pregnant ewes and cause abortion. If he has the company of another ram or a wether, he will thrive better than if kept alone. A small amount of a grain mixture of two parts oats to one part bran, together with some good clover, vetch, or alfalfa hay, and a few roots or a little corn silage will keep him in excellent condition. Mangels or sugar-beets should never be fed to rams and wethers, as they cause bladder trouble. During the summer, good pasture is sufficient, but a month before breeding season begins he will require some grain. While the ram must be in a good vigorous condition, there is great danger of having him too fat. Exercise is essential at all times.

Lambing time.

At lambing time the ewes require access to a shed or barn, although close confinement is very detrimental. Well-drained land that will stand tramping may be seeded to rape and clover, and the ewes run on this during the lambing season. Unfortunately, such land and climatic conditions are not everywhere available. When the ewes are strong and healthy, they will need little attention at lambing as compared with the attention required by range ewes. The most important equipment for lambing time is a set of panels about four feet long and two-and-one-

half feet high. Two of these panels are hinged together so that they will form the letter "L" when open. These panels are made into pens, four feet by four feet, by fastening one set in the corner of the barn so that the walls of the building form two sides and the panels the other

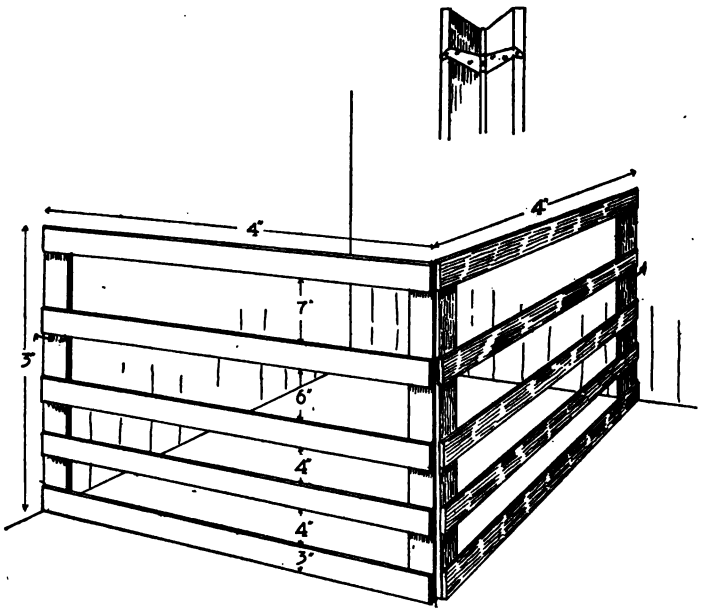


FIG. 14. — Lambing Panel.

two. After the first pen is made the next is made in the corner formed by the first one and the wall. In this manner a row of small pens may be made very easily and the panels, when not in use, may be stored in a very small space. Much attention is given the ewes at lambing time, and any ewe showing signs of lambing soon is sep-

arated from the remainder of the flock and shut up in one of the lambing pens. If she has been properly fed and cared for during the winter, little difficulty will present itself. She must be watched carefully to see that the lamb is presented properly and that she own her lamb after it is born. The latter difficulty presents itself very commonly when the ewe has little milk. With stub-born ewes stanchions often have to be used. These are made by driving stakes into the ground one on each side of the ewe's neck. In such a case it is well to feed the lamb a little cow's milk until its mother's milk-flow is started. The ewe and her lamb should be penned up until the proper maternal relations have been well established. This system of penning the ewes about to lamb will prove valuable, especially when the ewes drop twins or triplets. In such a case if the ewe were left with the flock she very likely would disown one of them, because the first lamb born usually is the strongest and would wander off looking for its first meal while its mother was giving birth to the other lamb, or lambs. It would thus be surrounded by other ewes and its mother would lose its scent and consequently disown it. When a lamb dies the ewe may be induced to become a stepmother to some orphan. The method of making the ewe own a strange lamb has been discussed in the chapter on lambing of range ewes.

Castration and docking.

All male lambs not intended for breeding purposes must be castrated. As a rule, at about the age of three months the ram lambs begin to know that they are males, become restless and not only fail to gain but actually lose the flesh put on in an early period. As a result, ram lambs

come on to the market with thinner flesh than wether lambs raised under the same conditions. They also annoy the ewes so they do not thrive.

Castration is a simple operation involving little risk when conducted with ordinary care and cleanliness. It can best be performed when the lamb is from one to two weeks old. The operation consists in cutting off the lower end of the scrotum and drawing out the testicles, together with the adhering cords. A little disinfectant poured into the holes from which the testicles have been removed prevents infection. The morning of a nice bright day is the best time.

Docking is also another operation commonly neglected by farmers. Failure to dock causes a loss of twenty-five to fifty cents a hundred pounds when the lambs are sold, depending on the amount of dirt collected. Tails are unnecessary appendages on sheep, and the blood nourishing the useless tail would add, no doubt, to the growth of the rest of the body. There are several ways of docking lambs; namely, chopping off the tails with a mallet and chisel, cutting off with a sharp knife, or removing with hot pincers. Of these three methods the latter is the most preferred as there is very little loss of blood when it is practiced. In any case, the tail should be removed so as to leave a stub or dock, which is one to one-and-one-half inches long. This operation should be performed on ewe lambs at one or two weeks of age, and with ram lambs, it should follow from five to seven days after castration. On large ranches, to save time, both castration and docking are performed at one time, but on smaller farms better results are obtained where they are done separately. The loss from castration and docking should not be more than one lamb in five hundred. Strange to

say, docking and castrating are commonly neglected on the farms, while on the range neglect in this regard is practically unheard of.

Growing the lamb.

In order to make the most out of a lamb whether he be a mutton or pure-bred lamb, he must be grown as cheaply as possible, which means to feed him well while he is young, as he then makes the most economical gains. It is well to put as much gain as possible on the lambs during the months of April and May, as these months are when feed and weather are best. The best results on the general farm in the Northwest are obtained when the lambs are grown on sown pastures such as vetch and oats, vetch and rye, clover, and rape and clover. Sheep are commonly kept on the general farms for scavenger purposes, but good lambs cannot be grown in this way. The common system is to have a few sheep to clean up the fence corners, stubblefields, and the like. The lambs receive no care and slowly mature into scrawny brutes of little value. If, instead of raising twenty-five lambs in this manner, the grower were to raise fifty by the more modern method, he would derive a much greater profit, while the ewes could clean up the fields after the lambs are weaned or sold.

It will be necessary to have several fields for the lambs in order to secure the best gains and that each kind of pasture may be utilized in its proper season. It is also especially desirable to have fresh pastures on which to finish the lambs if they are for the mutton market. Often the lambs do well until about ready for market. Then the pastures begin to fail and the lambs, which were so nearly done, begin to go backward, and the dry season

coming on, the lambs cannot be made ready for market until fall. By this time they are too coarse and heavy to bring the best price and have cost more money than they are worth. It is, therefore, essential that the ewes and their lambs be supplied with the most liberal pasture throughout the growing season. In the case of pure-bred lambs the pasture is of equal importance. In order to afford a number of different fields, portable fences are often used.

Grain.

The use of grain will depend on various factors, such as the prices of grain and of mutton, and the richness of the pastures. Ordinarily no grain need be used, but when mutton is a good price or when grain is rather low, some may be used with a profit. Lambs given grain will grow faster and finish better. In feeding grain, it is a good plan to teach the lambs to eat early in life; that is, when they are two or three weeks old. They can be fed in a "creep" so that they can procure the grain they need without interference by the ewes. A "creep" is a panel of fence arranged with upright bars so spaced that the lambs can go through but the ewes cannot. A mixture of two pounds of wheat bran, one pound of crushed oats, one pound of finely ground corn-meal, and one-half pound of oil meal is perhaps the ideal feed for young lambs. Another occasion where grain is very necessary is when the pastures are beginning to fail a little before the lambs are quite ready to market. A liberal feed of grain for a few days will often put the lambs in marketable condition and save the necessity of carrying them through the dry summer. Of course, the pasture should not fail before the lambs are ready, but sometimes there may be ——

lambs than there is pasture for, or perhaps weather conditions make the pastures poorer than there was reason to expect. The use of grain is of more importance in the case of pure-bred sheep than with the market sheep, since pure-bred lambs must be kept growing after they are weaned in spite of the fact that pastures dry up, and the only way that this can be accomplished is with the use of grain. The lambs, taught to eat grain long before they are weaned, have the habit of coming regularly to the feed trough well established before it is most needed. Pure-bred lambs do their best if fed during this first summer at the rate of a half or three-quarters of a pound of grain daily with as much fresh pasture as possible, but care should be taken not to have lambs off feed during the hot summer months.

Lambs handled in the manner outlined above should gain one-half pound a day, while under favorable conditions, and with extra feed and care, the daily gain may be close to one pound a day. When the gain is less than one-half pound a day, the feed is becoming a little scanty, and the lambs are not quite as thrifty as they should be.

Shearing.

On the farms throughout the Northwest, shearing is performed during the months of April, May, and June. The exact time of shearing will depend on the opinion of the owner, locality, season, shelter, and the like. Shearing should not be done too early or too late, as in one case the sheep suffer from cold after shearing and in the other, sheep suffer from heat before shearing. Many men have the mistaken idea that late shearing, because of increased flow of yolk, increases the income of the flock. This is true in a certain sense. It does increase the

returns on the fleece, but what is gained here is lost on the body of the sheep due to excessive heat. There is much more variation in the time of shearing farm sheep than range sheep, since the farmer has better protection for his flock in case they are sheared too early or too late.

Machine shearing is gradually taking the place of hand shearing, especially in the larger flocks. The amateur can learn to shear so much faster and easier with a machine that the farmer can easily sheer his own flock. Sheep are not damaged with the machine to the extent that they are with the blades. On the farm, hand machines are more commonly used than the power driven ones, and are satisfactory for flocks of twenty-five or fifty head. Hand machines, however, are not fast enough or durable enough for shearing large bands. While being shorn, the sheep must be handled as humanely as possible, as there are enough cuts at best. It is a good plan to place the fleece in a bin to cool before packing, as the manufacturers claim that it comes out of the sack in better condition. This is one of the good features of the Australian shearing sheds. Unscrupulous farmers often wet the wool, or place sand, stones, and the like in the wool sacks to increase the weight. It would seem as if selling sand, water, and stones at twenty-five to thirty cents a pound would be a profitable business, but the effect of this practice always comes back to the offender and the community, and buyers discriminate against farmers whom they suspect of such acts. In case wool is held for some time before selling, it should be stored in a cool place where the sun and wind cannot strike it. Wool normally contains about 13 per cent moisture which is legitimate and the farmer should do all in his power not to lose it. A more complete discussion of growing and handling the wool clip is taken

up in the chapter on wool production. While this chapter deals with the subject from the standpoint of the rangeman, it contains much information for the farmer breeder.

Dipping.

Dipping of farm sheep is even more important than dipping on the range, since ticks multiply more rapidly under farm conditions. The method of dipping is the same only it is conducted on a much smaller scale. Instead of having a vat fifty or sixty feet long, one ten or fifteen feet is large enough. With these short vats the sheep must be held in for a short time and not be allowed to swim through. The dips used for ticks and scab are the same as on the range.

Weaning.

In the case of lambs for the market, weaning is a simple process, as the lambs go direct to the market from their dams. With the pure-bred lambs, it is different. They are weaned at about three to five months of age. After the separation, the lambs should be turned into a good shady pasture far away from the ewes, and never returned. Lambs already taught to eat grain are easiest weaned. A stunted lamb never makes up its lost growth no matter how favorable circumstances may be afterwards. Forage crops, such as rape and clover, make excellent pasture for lambs, and where available, grain may not be needed. Ram lambs should be separated from the ewe lambs when not older than six months, and would better be separated at weaning.

Marketing.

Spring lambs are marketed whenever they become fat. This will ordinarily be at a weight of somewhere

between fifty and eighty pounds, the proper market weight being about sixty pounds. A farmer located near a large city can dress very early spring lambs on the farm, shipping by express and selling to hotels, clubs, and the like. The very earliest lambs bring fancy prices and are very profitable in spite of the higher cost of production, but since it is only a few of the very earliest that bring the fancy prices, the early lamb business must be limited to those farms so situated that the lambs may be easily marketed before the rush begins. The average farmer must, therefore, try to meet a more stable, although lower market. He can and must, however, get his lambs off before the range lambs come in. The large number of spring lambs are marketed in carload lots in the stock-yards. These lambs are young and tender and great care must be taken to see that they receive the least possible rough treatment on their journey.

The marketing of pure-bred stock is somewhat different, as they must be held until they are older. With pure-bred stock the farmer has two methods to follow; namely, selling his stock as lambs or as yearlings. Marketing in either case is done in the fall, just prior to the breeding season. The system of selling stock as yearlings is best when the farmer has enough land, since there usually is more money in it for the producer and the buyer is better satisfied. The sale of lambs for breeding purposes should be discouraged as much as possible.

Annual auction sales, wherever established, are the best means of marketing. Breeders should support these sales as they are the cheapest way for the buyer and seller to get in touch with each other.

o

Dry ewes.

After the lambs are shipped to market, the ewes are at once turned into dry pasture. Such feed will aid very much in drying up their milk and preventing spoiled udders. Also, the ewes would become too fat if kept on rich pastures after the lambs are weaned, and the expense of keeping them would be too great. Fortunately the requirements of the ewes fit in exactly with cropping conditions on the western farm. The lambs are sold or weaned at a time when the fields are becoming dry. The clover, vetch, and rape which were good earlier in the season become woody, and green feed is rarely available. But the ewes may be turned out on the drier hill pastures, on the meadows after the hay is cut, or on the stubble fields. In this way they will not only obtain the feed which is best for them but will procure it at the least cost.

Heavy milkers will require some attention, because their udders are likely to swell and spoil. These are the ewes that raise the best lambs, and their loss means an unprofitable flock. Persistent milkers should be milked two or three times at intervals of two, five, and seven days, but at no time should they be milked completely dry.

BARNS, TOOLS, AND EQUIPMENT

Barns.

A sheep barn differs from a cattle barn or other stock barn in that it must have more floor space and less hay mow. In building a sheep barn, the farmer has to concern himself only with the floor space, as the hay mow capacity will take care of itself. There are two general types of sheep barns found in the West, one with all the hay overhead and the other with the hay in the center

and running to the ground. In most localities one or possibly two sides of the barn are left open. The need of protection for sheep is against rain, snow, and wind, and a barn open on one side, or possibly two sides, if placed properly, will furnish all of this protection. Sheep are clothed naturally with one of the best non-conductors of heat that is known, and in a closed barn they very easily become over-heated and go off feed. In some localities the open side is absolutely necessary. Whether the barn is open on one side or closed, ample ventilation must be furnished. In building a sheep barn or shed of any type, if the posts are set at equal distances in every direction, panels can be made so they will fit any place in the shed. A distance of either ten or twelve feet from center to center is a good dimension. In practice this will be found very convenient, since with the panels the same size and the distances between the posts the same, pens can easily be set up in any part of the barn desired.

Light is as essential as ventilation, and windows should be well distributed around the outside walls of the barn.

A part of the barn can be set aside for the storage of roots and grain; another part for a hospital, and shepherd's room. This part of the shed is usually furnished with a stove, which is very convenient during lambing time in treating chilled lambs. The best location for the hospital room is adjoining the shepherd's room.

Running water in the shed is quite an asset, and if possible should be piped to troughs in the various pens.

Sheds can be used for the housing of sheep where the hay is stored in the horse or cattle barns or where it is stacked in the open. A shed open away from the prevailing winds will furnish ample protection in most places.

Often it is desirable to have a shed that can be moved

from place to place on the farm, especially where there are sown pastures that have no shade. The illustrations (Plate VI), show a portable sheep shed, which was built at the Oregon Agricultural College, and which has proved very satisfactory. The outside dimensions of the complete shed are twenty-eight by eighty feet, affording protection for a large flock of sheep. The shed is built in eight sections and each section is built on skids so that it may be moved to any place desired. Each section is twenty feet long and fourteen feet wide and can be constructed at a cost of about $15.00 or $16.00 for material. The great advantage of this shed is that it can be moved from place to place and even be moved through a twelve-foot gate and can be set up as one shed or be divided into two, three, or four parts. Two horses haul a section without difficulty. While portable sheds have their place, a permanent structure is always more satisfactory whenever a permanent location is available.

Panels.

Panels of various sorts are very convenient about a sheep shed, and can be cheaply constructed out of one by three-inch lumber. A good height for a panel is about two-and-a-half feet. The construction of panels should be such that they will be light in weight and yet have considerable strength also.

Feeding racks and troughs.

Hay and grain may be fed from the same rack, but separate racks are generally preferred. All racks must be so constructed as to permit easy cleaning, since of all farm animals, sheep perhaps are the most particular about their feed. They will not eat from dirty racks. The grain trough is usually made one foot wide and three

PLATE VI. — SHEEP SHEDS.

Above, a good type of permanent barn; below, sectional portable sheep shed as used in winter, in transit, and as a summer shade.

inches deep, and of desired length. A one by four inch strip may be built in about a foot above the trough to

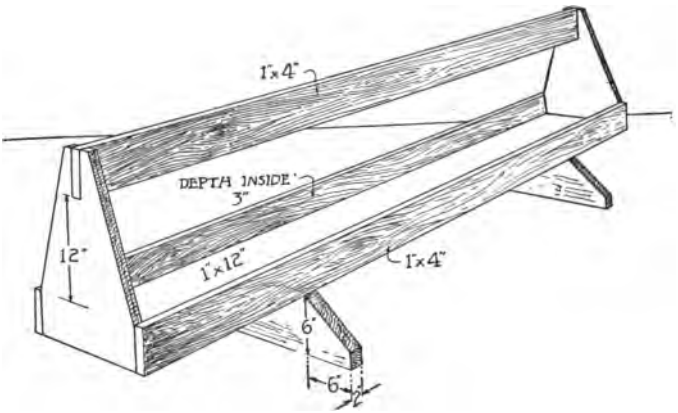


FIG. 15. — Self-cleaning Grain Trough.

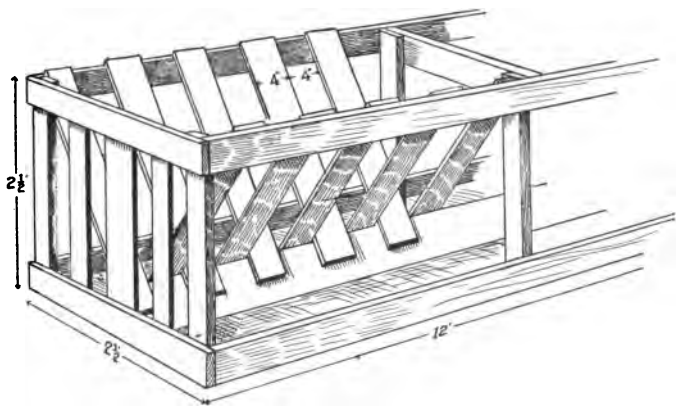


FIG. 16. — Combination Grain and Hay Rack.

prevent the lambs from jumping across it. The legs are so placed on the trough that when it is tipped over

the grain and feed will drop out. This type is usually known as a self-cleaning trough. If these troughs are tipped over after each feeding, little further attention need be given to the cleaning. A combination hay and grain rack usually is heavier in construction, and because of this it is inconvenient to tip it over for the cleaning of the trough each time, and therefore a little more care must be exercised as to cleanliness.

While self-feeders have proved very satisfactory for feeding grain to hogs, they have not proved so with sheep. The death rate with sheep on self-feeders is much greater than where they are fed by hand, and the gains are less economical.

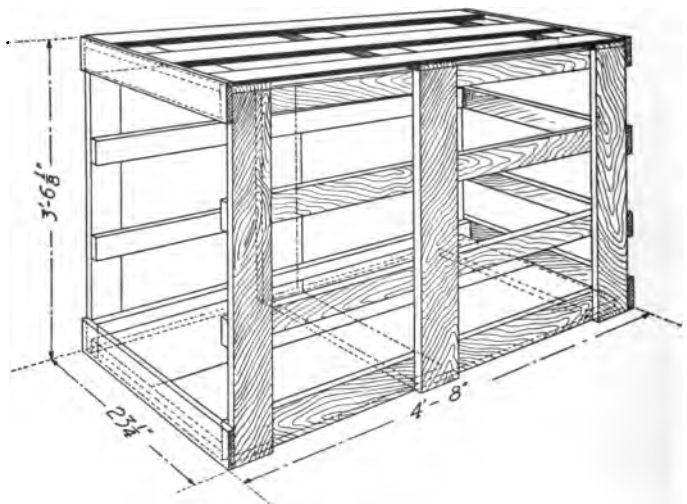


FIG. 17. — Shipping Crate.

Shipping crates.

A few shipping crates should always be at hand when pure-bred sheep are raised, since a buyer will often insist

on immediate shipment. During haying or harvest, it is a nuisance to stop and build a crate, and the sale may be lost on that account. Crate building is a good rainy day job. They are built of one by three-inch material and are so constructed as to combine as far as possible strength with lightness. They are made barely large enough for the sheep to stand comfortably.

Shepherd's crooks.

Shepherd's crooks have been in use for centuries and are still a very necessary article, especially with high class sheep. With a crook the flock can be worked over

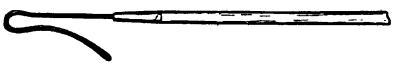


FIG. 18. — Sheep Crook.

and handled with much less excitement than without. The Jaxon type of sheep crook is very satisfactory. Dipping crooks are very handy at the time of dipping. They are made with a large double crook, and by their

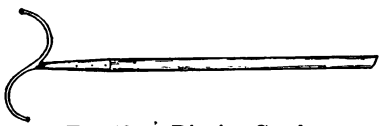


FIG. 19. — Dipping Crook.

use the sheep can be either pushed under the dip or pulled out, as desired. A home-made dipping crook can be made out of two pieces of wood.

Dipping vat.

A dipping vat on a sheep farm should be built as durable and lasting as possible, and located so that it cannot be

reached by horses and cattle. Where gravel is available, a concrete dipping vat is the cheapest in the end. The vat itself is about ten to fifteen feet in length. With a long tank, sheep do not try to jump over it and thereby injure themselves by striking the other side. All the panels in the corrals and runs should be as smooth as possible and free from projecting nails and slivers, because crowding sheep are likely to cut and bruise themselves on such projections, and in the case of dipping in lime and sulfur or dips of that nature, blood poisoning may result. There are various types of approaches to the tank, some which use a decoy and others which have a trap-door and still others which have no special device for getting the sheep into the vat. The decoy system possibly is the best. Sheep have a great desire for company and will usually endeavor to go where they see another sheep, and in their effort to arrive at the decoy fall into the tank. This system removes nearly all of the labor of pushing the sheep into the dip. The trap-door arrangement works fairly well, but the sheep have to be pushed more or less. In the other method, there usually is a small inclosure just at the beginning of the tank into which a lot of sheep are run, and a man catches each sheep and forces it into the vat.

One of the essentials of a good dipping vat is that the outlet should not be made too steep or the sheep may injure their feet and strain themselves in getting out.

The draining pen is so constructed that all of the dip will drain back into the vat. The dip usually runs from the draining pen into a well, or catch basin, where the sediment settles to the bottom, while the dip runs back into the vat. The draining pen is divided in two, with a swinging door between, so that one side can be filled up,

while the other side is draining. When the second side is filled, the first side has sufficiently drained so that they can be turned out. When poisonous dips are used, the sheep need to be well drained before they are turned out to pasture, to avoid poisoning the grass. However, this danger is not as great as one might think, and if the sheep are not too closely confined, the amount of arsenic they would consume while eating grass is not sufficient to harm them. Some shepherds use the arsenic dip in minute quantities for treating lambs for stomach worms, but there is a possible danger even in this.

Dodging chute.

Farmers having small flocks separate them by "legging out" the sheep, as they call it. This is a very bad practice and should not be continued. A little money invested in a dodging chute saves much time and labor as well as injury to the sheep. There is absolutely no better way of separating lambs from their ewes than by running the flock through the dodging chute. One might think that the matter of separating lambs from the ewes would be simple and that all that would be necessary would be to catch the lambs and lift them over the panels into a second pen. Experience shows that such a practice very often results in some lame lambs. Lambs at weaning time are very tender, and injuries of this sort mean the loss of the lamb. A dodging chute consists of a long narrow chute at the end of which is a swinging gate which opens into two pens. The main essential of a dodging chute is length. The longer the chute, the better and faster the sheep will travel through and the greater the opportunity the operator of the dodge gate has to observe his sheep and decide into which pen they go.

Corrals.

Corrals are very necessary in handling sheep for any purpose. They are best made of one-inch to six-inch material, dressed on one side, and the fences should be at least three or four feet in height. Such a corral is very convenient for sheep that are to be sold or for sheep that require treatment for foot-rot or various other ailments. It is a poor practice to catch a sheep in the open field. A sheep caught in an inclosure realizes that its liberty is limited and does not make such an effort to get away. It, therefore, is not frightened and does not have the opportunity of causing disturbance among the remainder of the flock. The corrals can be built as lots around the sheds or barns and therefore need not be considered as extra equipment, but they should be small enough that any of the flock can be caught without much disturbance.

Sheep fencing.

Portable sheep fencing is at times very convenient. Such a fence may be made out of lumber in the form illustrated in Fig. 20. The panels are made out of one inch by four inch or one inch by three inch material, fourteen to sixteen feet long. The standards are of the same material and made in the form of a triangle. The panels are set in these triangles or braces, the ends of two panels sitting in one standard. Another kind of portable sheep fence is made of woven wire and stakes. Woven wire and stakes can be moved as conveniently as the portable panel fence, and when it is up if the wire is stretched, it makes a better appearance and is a more serviceable fencing. For any fence less than ten rods, the panels are good, but for a longer fence the woven wire is better.

Lack of adequate fence has been one factor in the decline

of the sheep industry in many localities, and a good permanent fence is the cheapest in the end. Sheep are the easiest to fence of all farm animals. Almost any board or woven wire fence will turn sheep. Barbed wire cattle fences are about the only kind that will not turn sheep, and these

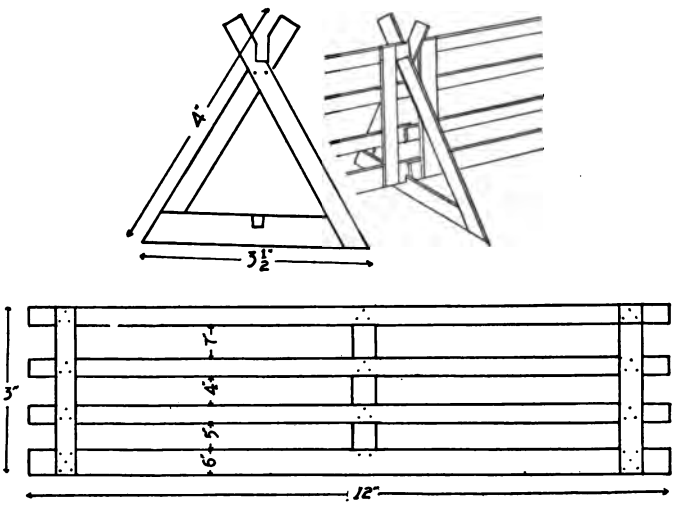


FIG. 20. — A Good Portable Fence.

not only do not turn them but tear out a quantity of valuable wool. Farm fences, however, must turn cattle and horses and often hogs as well as sheep. When this is the case, it is easy to go a step farther and make a fence that will turn dogs and coyotes as well. A good woven wire close enough at the bottom to turn hogs and about five feet high with a barbed wire on top will turn almost any dog or coyote; in fact, very few dogs will jump a four-foot fence. The bottom of the woven wire may be placed in a furrow and the soil turned back against it, or

it may rest on the top of the ground with a barbed wire at the bottom. Such an arrangement will prevent dogs from going under. A dog- and coyote-proof fence has been proven to be entirely practical, and it is only a matter of a short time until all farm fences will be practically dog-proof.

Lamb-creep.

A lamb-creep is a small pen having on at least one side a panel made of vertical slats so spaced that the lambs can readily slip through but the ewes cannot. Inside the creep there are troughs in which grain is placed. The lambs can thus pass through into the creep at any time during the day and obtain a mouthful or two of grain. In this way they balance their ration and get additional nourishment which will make them develop at a much earlier age than they otherwise would. The panels of a lambing-creep can be easily made by putting the strips vertical about ten inches apart. The edges of the upright sticks are rounded off so as not to tear the wool. Elaborate creeps can be made, using rollers in the place of sticks, so that the lambs passing through do not injure themselves or their wool in any way. These rollers are especially good after the lambs become rather large.

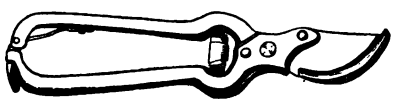


FIG. 21. — Pruning Shears are Useful in Trimming Hard Hoofs.

Hoof-trimmers.

During wet weather, the best hoof-trimmer is a good, sharp jackknife of the type stockmen usually carry. Dry weather requires a somewhat different implement, since the shell of the sheep's foot is very hard at this time. Small pruning shears or

a good hoof-pincher are best instruments in this case. The foot, after having been trimmed with the pincher or pruning shears, may be dressed with a good rasp or a jack-knife.

Docking instruments.

The instruments used in docking are a sharp pocket-knife, docking chisel, or docking pinchers. The knife needs no explanation. The docking chisel is usually made of rather heavy iron, and has a broad blade and a long handle. The edge of the chisel is fairly blunt and in use, the chisel is heated to a dull, cherry red heat, and the lamb's tail is pinched off with the hot chisel against a block, the heat searing the blood vessels. The principle on which the docking pinchers work is similar to that of the docking chisel; that is, the pinchers are so built as to retain heat for a considerable time and the edges are not sharp.

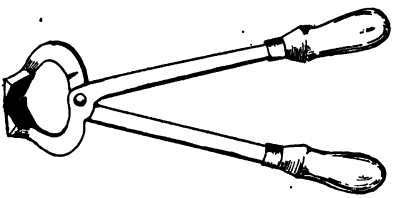


FIG. 22. — Docking Pinchers.

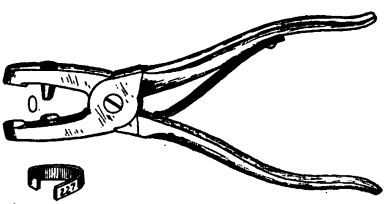


FIG. 23. — Ear Labeling Punch.

Ear-labeling punch.

In a pure-bred flock, an ear-labeling punch is necessary. Such a punch can be procured from any stockmen's supply house. It combines a punch to make a hole in the sheep's ear and a pincher to close the label after it has

been inserted. The punch can be used for marking sheep where a system of ear notching is used.

Branding stamp and iron.

On the farm it is sometimes desirable to mark sheep so that they may be easily identified. The commonest practice is the use of a branding paint or fluid which is applied with a branding stamp. Such a stamp can be very easily made out of a block of wood and a piece of leather. A block of wood about four inches in diameter and eight inches long is cut out so as to form a handle with a disk at one end. Any figure or letter can be cut out of leather and tacked on to the disk. Several thicknesses of leather are used so as to make a total thickness of not less than half an inch. Nothing but standard branding fluid should be used with such a system of marking, because of the damage of permanent paint to the wool. Since the stamped brand lasts only until shearing, many farmers prefer the use of a hot iron branding on the nose of the animal, or on the horn in the case of such breeds as carry horns. Such brands, of course, are of a permanent nature.

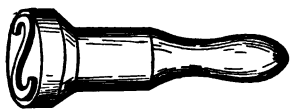


FIG. 24. — Branding Stamp.

Trochar and canula.

This instrument is used in giving relief to sheep that are suffering from bloat and is much better for this purpose than the pocket-knife. It consists of a sharp-pointed steel (the trochar) which fits inside of a metal tube or sheath (the canula). When used, the point of the combined instrument is pushed through the skin

and into the paunch of the bloated animal and the trochar removed, leaving the canula in the opening. The canula keeps the hole open, so the gas can pass off from the paunch. After the animal has been relieved, the canula is removed and a little disinfectant placed on the wound. A knife may be used to relieve bloat, but when there is nothing to keep the hole open, the operation is ineffective in a great many cases.

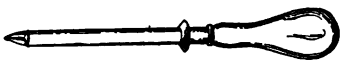


FIG. 25. — Trochar and Canula.

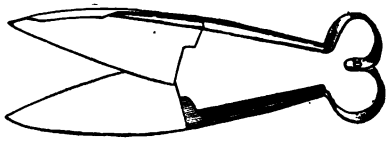


FIG. 26. — Hand Sheep Shears.

Hand sheep shears.

Even though a farmer shears by machinery, he should have a pair of hand sheep shears. They are necessary in tagging, an operation that is absolutely necessary at breeding and lambing time. They are also very convenient in the case of maggots in the wool, since the infested wool may be removed.

Wool box.

The wool box or wool board is a piece of equipment that is gradually passing out of use. It is constructed out of five pieces of wood hinged together. In use, the wool box is spread out flat and four pieces of twine laid across it, two crossing in one direction and two at right angles. The fleece is placed in the middle of the box. The box is then folded up to form a box and the twine tied over the top of the fleece while the box is in this position. A fleece tied in such a box has a very good appearance. An objection to this system of tying fleeces is that

it requires considerably more twine than is necessary. Fleeces for display might well be tied in this manner.

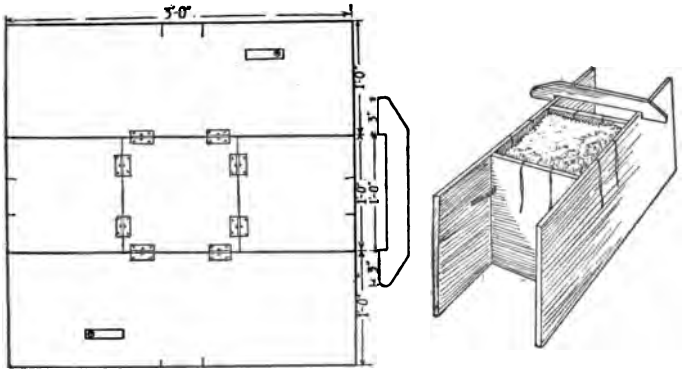


FIG. 27. — Wool Box or Wool Board.

Sheep bell.

The old practice of using a sheep bell on the leader of a flock is a good one in regions where pastures run back into wooded land and where sheep could graze and be out of sight. The tinkle of the bell will locate the sheep even though they are at a considerable distance. The sheep themselves tend to follow a bell and thus do not separate.

CHAPTER XIV

FEEDING FARM SHEEP

THERE are several factors which operate to determine success or failure in the feeding of farm sheep. These factors may be enumerated as follows: (1) regularity, (2) uniformity, (3) variety, (4) cleanliness, (5) exercise, (6) shelter, and (7) shearing.

REGULARITY

Sheep are very quick to learn the time and place of their feeding. Shortly before feeding time they usually are very quiet, but soon they become more or less restless, and at the exact time that feed should be given they will be standing up at the gate or around the troughs where they will make considerable disturbance until they are fed. Successful sheep-men, therefore, never allow the feeding hour to pass without giving the usual feed, as much flesh is lost by this worrying of the sheep when the feed is late. Sheep do not require a large amount of attention, but the attention that they do receive must be very prompt and regular.

UNIFORMITY AND VARIETY

Sudden changes of feed, either in kind or amount, are very likely to cause digestive disturbance in the sheep and in all probability weak spots in the wool. Sheep like

considerable variety but the best results are obtained when this variety is uniformly fed. Gradual changes from one feed to another are not harmful but often beneficial.

CLEANLINESS

Because sheep are great weed destroyers and utilize the odds and ends about the farm, it is often assumed that they are not particular about what they eat. This is a mistake. Sheep picking weeds and odds and ends select the more choice parts and consume them fresh. If offered feed that has been nosed over by other stock, they will refuse it or will eat it without a relish. Feeding troughs in which feed has been allowed to accumulate and sour are extremely distasteful to them. Feed-racks so arranged as to let the hay down a little at a time, thus preventing the sheep from breathing on it, are the best. Cleanliness is of the utmost importance in the feeding of all classes of sheep.

EXERCISE

Exercise is very conducive to the natural development of the sheep. This is particularly true of growing stock. Young sheep confined too closely are very likely to be delicate in their later life and not attain normal development. Plenty of exercise and good feed are the two main factors necessary for a good breeding flock. Exercise prevents the ewe from accumulating too much body fat and at the same time it makes her appetite much keener. In the case of lambs that are being fattened for the market, as much exercise is not needed as in the case of growing or breeding stock. However, they should not be confined too closely because of the effect that exercise has on the appetite. Gains made by sheep depend very largely on

the amount they eat, but too much exercise in the case of fattening sheep may make the cost of a hundred pounds of gain a little greater.

FALL SHEARING

The question of fall shearing is one that has caused considerable discussion in the feeding operations of the West. In many localities where the climate is mild, sheep that are shorn before being placed on feed will oftentimes make larger gains than if unshorn. Taking all in all, it is very questionable whether the practice of shearing would be profitable to the farmer, since shorn sheep are docked on the market so as to compensate the buyer for the loss of the wool.

CONCENTRATES

The concentrates used to the greatest extent in the feeding of sheep throughout the West are corn, barley, oats, wheat, speltz, peas, cotton-seed cakes, linseed oil meal, and bran. They all have their merits and their limitations.

Corn.

Corn has been fed more to fattening sheep in the United States than any other grain, but plays its greatest part in the feeding operations of the Corn-Belt. The western states being removed from the region often have to rely on other grains. Wherever it is successfully grown, corn possibly makes the best concentrate for fattening sheep. It can also be used with good success when fed in limited amounts to breeding and growing stock, although it is too carbonaceous in character to form more than a part of their ration. It may be shelled and cracked, or ground.

Barley.

Barley is one of the very best grains that we have. In the West and the Northwest, it has gained its widest popularity in the feeding of sheep, and the results from its use have been quite as favorable as that from corn. It, like corn, is a carbonaceous feed, and because of this it should not be fed in too liberal a quantity to breeding stock.

Oats.

Oats should, and usually do, form the basis of grain mixtures for feeding farm sheep. They are highly nutritious and perfectly safe, and are usually grown on all sheep farms. As a single grain feed for sheep, oats meet practically every requirement. There is no better feed for toning up breeding stock or for feeding show sheep. For fattening purposes, oats alone may be used, but to get best results, they should be mixed with carbonaceous feeds such as corn and barley.

Wheat.

Because of the prevailing high prices that are paid for wheat, it is not extensively used as a sheep feed, although damaged wheat and wheat screenings are fed throughout the western states. In some feed-lots, wheat mixed with barley is used for fattening purposes. Sheep prefer the wheat whole rather than ground.

Emmer.

Emmer, or spelt as it is commonly known, is a rather inferior grain for feeding sheep, and in most of the feeding trials in this country has ranked very near the bottom. It is used only where it can be grown cheaper than other grains.

Peas.

Cracked peas or pea meal are highly nitrogenous, and because of this are rarely fed alone, but rather in conjunction with other feeds. There is no feed quite equal to peas to put on the extra finish required for show sheep. They give firmness and character to the flesh that no other feed will do. Peas are usually rather expensive and for that reason do not enter into the usual farm rations.

Cotton-Seed Products.

Cotton-seed cake and cotton-seed meal are used as supplementary feeds. They are not usually fed alone but mixed with the grain at the rate of about 10 per cent of the meal or cake. Fed in this manner they are very good in rations that would otherwise be low in protein.

Linseed Products.

These feeds, like cotton-seed meal and cotton-seed cakes, are very high in protein matter and they are of course fed in the same manner. They are usually preferred to the cotton-seed products. In the feeding of any of these nitrogenous feeds, the pea-sized cake is best. The meal is rather fine and has a tendency toward gumming or forming an undesirable paste in the sheep's mouth.

Bran.

Bran is a superior concentrate for sheep when fed in connection with various grains, and can usually be substituted advantageously for one-fourth to one-half of the grain ration. It is especially good for breeding stock and growing animals. There is no other concentrate better than bran for ewes about to lamb or that have just lambed. Being of a laxative nature, it has a tendency

toward keeping the bowels in very good condition. A grain mixture consisting of oats and bran is exceptionally good for breeding stock, and on most farms is the cheapest feed available.

SUCCULENCE

Succulent feeds such as roots, kale, and cabbage are of considerable value in winter feeding, since they furnish for winter what pasture furnishes in summer. A little succulence as a part of the daily ration has a very good effect on the bowels and general condition of the animal, and produces results which are difficult to obtain otherwise.

Roots.

One of the commonest succulent feeds in the western states is roots. Breeding ewes thrive especially well on this form of succulence, and with all classes of sheep, roots prevent constipation and keep the sheep in healthy condition. There is no superior feeding value in the dry matter of the roots over that of grain, but they are especially valuable because of their tonic effect on the system. Roots should be cut into small pieces before feeding, hence a root-cutter is practically indispensable when many roots are used. When roots are not cut, choking may occur. Three to four pounds a day is sufficient for the average sheep, and it is not customary to feed breeding ewes much more than two pounds a day because lambs from ewes fed excessively on roots may be large, soft, and flabby. The commonest roots in the western states are turnips, rutabagas, sugar-beets, and mangel-wurzels. The first three are the best for sheep feeding. The last two, namely, sugar-beets and mangel-wurzels, should not be fed to rams under any circumstances because of the

bad effect on the kidney and the bladder. They should be fed only with great care to ewes.

Kale.

Kale is used especially in the Willamette Valley where the winter climate is mild and where the mercury seldom drops below the freezing point. The kale plant remains green all winter and is cut in the field and hauled direct to the barn, where it is fed either whole or passed through a cutter. If run through the cutter, the entire plant is consumed, otherwise the coarser stalks are not eaten.

Cabbage.

On the average western farm there is usually more or less cabbage, but because of human consumption, it usually has too high a market value for sheep feed. However, when grown to any extent, there are always damaged, unsalable heads which can be used to great advantage as sheep feed. Sheep relish cabbage, eating it when they refuse all other feed. Cabbage is used extensively in the feeding of show sheep, since it can always be purchased on the show circuit and is very easily handled.

SILAGE

Silage is being used more and more for sheep throughout the western states. Fed in quantities of two pounds a head a day, it provides an excellent supplement to the ration for breeding ewes. Care must be exercised in the feeding of silage, however, because musty and moldy silage is poisonous to sheep. In most trials at the experiment stations, the gains from silage have been somewhat below that from roots, but the cost of the gain usually has been in favor of the silage. These trials, however, have

been carried on in the Corn-Belt where corn silage can be produced at a lower figure than it can on the average western farm. For this reason the figures may not have the significance to the western farmer that they otherwise would. A silo for less than 250 sheep is too small to be practical unless there are other stock to be fed silage as well as the sheep.

HAY

Sheep everywhere are largely and often exclusively wintered on hay. Being more or less dainty about their eating, the hay must be of the very best quality and certain kinds cannot be used at all. The commonest hays that are used throughout the western states are alfalfa, clover, vetch and oats, vetch and rye, and vetch and barley. These are all good. Possibly the alfalfa hay in localities where it can be grown is the best sheep hay, but clover hay is a very close competitor. Such hays as timothy and prairie hay should not be fed to sheep when other hay can be obtained. Timothy hay does not have a very high feeding value for sheep and is extremely objectionable because the heads become lodged in the wool and working their way down to the skin of the animal cause much irritation. Prairie hay, likewise, is of a comparatively low feeding value for sheep. The trials at some of the western experiment stations show that when prairie hay was fed to sheep, it required additional grain to the extent that the cost of the grain equaled the cost of both hay and grain where the alfalfa was used. Under such conditions, a farmer could not afford to feed prairie hay when he could grow the alfalfa or clover. As a rule, it is impractical to attempt to grow farm sheep without some form of legume hay.

SOILING CROPS

The practice of soiling sheep is not a profitable one. Sheep are very dainty about their feed and will refuse to eat soiling crops after they become more or less wilted, preferring them while they are still crisp and green. The extra labor necessary to feed soiling crops is, therefore, wasted.

PASTURES

During the summer months the question of pastures is a very vital one to the sheep farmer. If his lambs are dropped early, he must have pastures that he can utilize at an early date in the spring. If, on the other hand, his lambs are late, he must have pastures that will extend well into the summer before they dry up. Pastures may be permanent or annual. Both have their merits, and on the average sheep farm it is not a good practice to rely entirely on one or the other. Permanent pastures may be used to a good advantage during the wet weather when it would be harmful to pasture on a cultivated field. They can be used as tramping grounds for sheep during the months of the year when the weather is rather rainy. The disadvantage in the use of permanent pastures is that they usually dry up during the hot dry months; and also there is always the ever present danger of parasites. When stocked heavily with sheep year after year, it is almost impossible to prevent permanent pastures from becoming infested with stomach worm, liver fluke, and other parasites. Annual pastures yield heavily and may be used at the time of the year when permanent pastures dry up. They are used in this country more to supplement permanent pastures and to flush and fatten sheep than as a complete pasturing system. A number of crops

may be used, such as rape, oats, and peas, vetch and oats, rye, cowpeas and soy beans and kale.

Rape.

Rape is one of the most popular of the annual pastures. It is used largely for lamb pasture at weaning time and for the flushing of ewes. No other feed is better for the latter purpose. Rape can be grown in almost any location and sown so as to be ready at any time desired. From eight to ten weeks after sowing, it is ready for use. There is more or less danger of bloat or hoven from the pasturing of the sheep on rape. However, if the sheep are well fed and watered before being turned into the rape, there is not much danger in this regard, although there will always be a certain small percentage of loss no matter what precautions are taken.

Rape and clover.

Rape and clover is a very good annual pasture in certain regions, especially in the Willamette Valley. The rape and clover is usually sown sometime in June and the pasture is ready for use the following fall — the rape being of sufficient stand to permit of considerable pasture at that time. It should not be grazed too heavily the first fall, as it will otherwise come up again in the spring and give considerable early pasture. Later in the summer the clover comes on and gives pasture for the dry months. Experiments at the Oregon Experiment Station tend to prove that this is the cheapest of all pastures for sheep.

Field peas.

Field pea pastures are used for fattening sheep in some parts of the West. This practice is very common in

Colorado, this state being noted for its pea-fattened lambs. Maturing rather late in the season, peas are especially suitable for fattening range lambs. The lambs are turned in when the peas are well filled, and allowed to remain until the field is cleaned up. Peas are sometimes sown with oats for summer pasture.

Vetches.

Vetches are usually sown with some other crop, such as oats, rye, wheat, or rape. Sown in this manner they make a very good pasture in some sections, especially in the South and the extreme Northwest. Spring lambs of western Oregon and Washington are usually grown on this type of pasture, as they furnish one of the earliest spring pastures for that section. A very common practice is to sow vetch and grain in the fall and graze it off in the spring, later cutting it for hay. Hay made in this manner is of very good quality, as it does not become coarse and tough, and is not cut until dry weather.

Rye.

Rye is commonly used for fall and winter pastures and is probably more widespread in its use than any other annual pasture. It is not suitable for late spring or summer use as it becomes too hard and woody by that time.

Wheat.

Many farmers allow their sheep to pasture on their wheat fields a short time in the spring. This is a good practice in humid sections where wheat is making a too rapid growth.

Kale.

Kale is used to a very limited extent for pasturing. Its most common use is that of a winter soiling crop in climates that do not fall below the freezing point. At such seasons cultivated ground is too wet to pasture.

Alfalfa.

Throughout the irrigated sections alfalfa makes a very heavy yielding pasture. Sheep grow and fatten rapidly on alfalfa pasture, while the heavy yield makes the cost low. Unfortunately there is always danger of bloat on alfalfa, especially in midsummer. The average loss of ewes and lambs on alfalfa pasture is about 10 per cent for the season. This figure, however, represents only the approximate average. In actual farm practice one may sometimes pasture alfalfa for several years and not lose a sheep and again half or two-thirds of the flock may be lost in one day. So far no sure preventive has been discovered, although innumerable plans have been tested. The farmer who uses alfalfa for his sheep must, therefore, figure on taking some chances.

PLATE VII. — "BAD LUCK."

Above left, down in a dead furrow; above right, caught in the brush; below left, docking and castration are often neglected; below right, lamb held in position to dock and castrate. A little work at the right time saves much trouble.

CHAPTER XV

LUCK WITH SHEEP

In every locality there are discouraged farmers who say, "I have never had any luck with sheep." A careful investigation reveals that the matter of luck had nothing to do with the failure, but that ignorance and mismanagement drove him out of the business. Statements that sheep do not require as much work as other forms of farming are quite true, but this does not mean that they require no care whatever. Turning sheep into a back forty and allowing them to manage themselves is poor business and no profit can be expected from such a system. Sheep should be given the necessary protection from dogs, wild animals, and other peculiar dangers which beset them. All the profits of the flock may be lost in one night from dogs or wild animals. A very common danger to sheep is the "dead furrow." Heavily wooled sheep falling on their backs in a dead furrow or ditch seldom are able to get up and consequently die in a few hours unless help arrives, Many persons think that sheep are difficult to care for, yet this is denied by the most successful sheep-men. The man who willingly gives his sheep the care actually required does not find the task difficult, while the man who tries to shirk and leave something undone finds himself constantly in trouble. Ignorance of these facts or carelessness in regard to them often costs large sums of money.

HANDLING SHEEP

In handling or working over the flock, care and gentleness must always be exercised. Hired help of the rough cursing sort should never be tolerated on a sheep farm. They are worse than useless. One man understanding the nature of sheep with care and gentleness can accomplish more than a dozen men of the other sort. Some of the better ways of performing the commonest operations of a sheep farm are described in the following paragraphs.

Driving.

In driving a flock of sheep, one must always be careful not to drive too fast, particularly on a warm, sultry day. Sheep are so heavily covered with wool that they are very easily over-heated. The sheep-man can save not only the sheep but himself a large amount of work and worry by taking things easier. In turning corners at cross-roads, a lump of dirt or a pebble or two, thrown so as to fall in the road which the sheep are not to take, will usually guide them into the right road, thereby saving many steps. The lump of dirt or a stone should be thrown so as to drop in the road just at the time the head sheep are at the turning point. A shout or whistle accompanying the fall of the stone very often will help. After the first two or three sheep have turned, there need be no worry about the remainder of the flock. Sheep naturally follow their leader, even when it leads over dangerous routes and possibly to death.

In driving sheep into cars and dipping vats or difficult corrals, a considerable amount of work can be saved by merely holding a sheep in the place where it is desired to drive the entire flock. When the sheep see one of their number ahead of them, they drive much more easily.

Catching.

One should never try to catch a sheep in the open field, but instead should drive the flock into a corral or an inclosure where the sheep may be caught without unnecessary chasing and frightening of the entire flock. The proper way to catch a sheep is by the neck, the flank, or the hind leg. In catching by the hind leg, never grab lower than the hock, as the sheep will struggle and possibly dislocate one of the joints of the leg. A very humane method of catching sheep is that of using the "Jaxon" or any other standard type of sheep crook. With a crook, sheep can be caught at a distance and the flock is not frightened. Catching a sheep by the wool causes bruises which will show plainly on the carcass in case the animal is slaughtered within the next few days.

Leading Sheep.

After the sheep has been caught, one should never try to lead it by taking hold of the wool of its neck and pulling it along. Instead, one should stand on the left side, place the left hand under the lower jaw and the right hand on the dock or tail. By gently pressing on the dock, one may easily cause the animal to move to any place desired. In this manner the left hand is used in guiding the sheep and the right hand is used to make him go. Dragging sheep, even over a smooth pavement, is unnecessarily hard on both man and sheep.

Lifting and Carrying.

Occasions often present themselves when it becomes necessary to lift and even carry small sheep for a short distance. This can be most easily performed in the following manner. Standing to the rear of the sheep and a little to the right side, place the right hand just back of

the right front leg and underneath the brisket. Gently raise the front end of the sheep off the ground. With the left hand grasp the left hind leg at the hock and lift the sheep up. By this method struggling is prevented and no harm will be done to the sheep.

Setting a heavy sheep on its rump.

With a light sheep or lamb it is a relatively easy task to set it on its rump by simply lifting it up and setting it down. With heavier sheep, however, especially rams and ewes that are heavy with lambs, this would not only be impossible but dangerous. Perhaps the best way to upset a heavy sheep is to stand at the left side, place the left arm around the front of the sheep and with the right arm reach across under the animal and grasp the right hind leg at the hock. Then by gently pushing the sheep with your chest and at the same time drawing its right hind leg, the animal is easily rolled over on its rump. One should never set a sheep squarely on its rump, as all the weight then comes on the dock or tail-head and will cause much uneasiness to the sheep; let it tip to one side or the other, supporting it with your knee. To get the sheep back on its feet, merely push it forward and let it go. A sheep should never be allowed to fall on its back or side where it will have to struggle to regain its feet. Such a practice is likely to result in ruptures.

Hauling sheep.

At all times sheep should travel on their feet even while being hauled. A wagon to haul sheep should have slatted sides sufficiently high to prevent their jumping out. Boards may be laid across, forming a cover to the wagon. A wagon rack that is about fourteen feet long

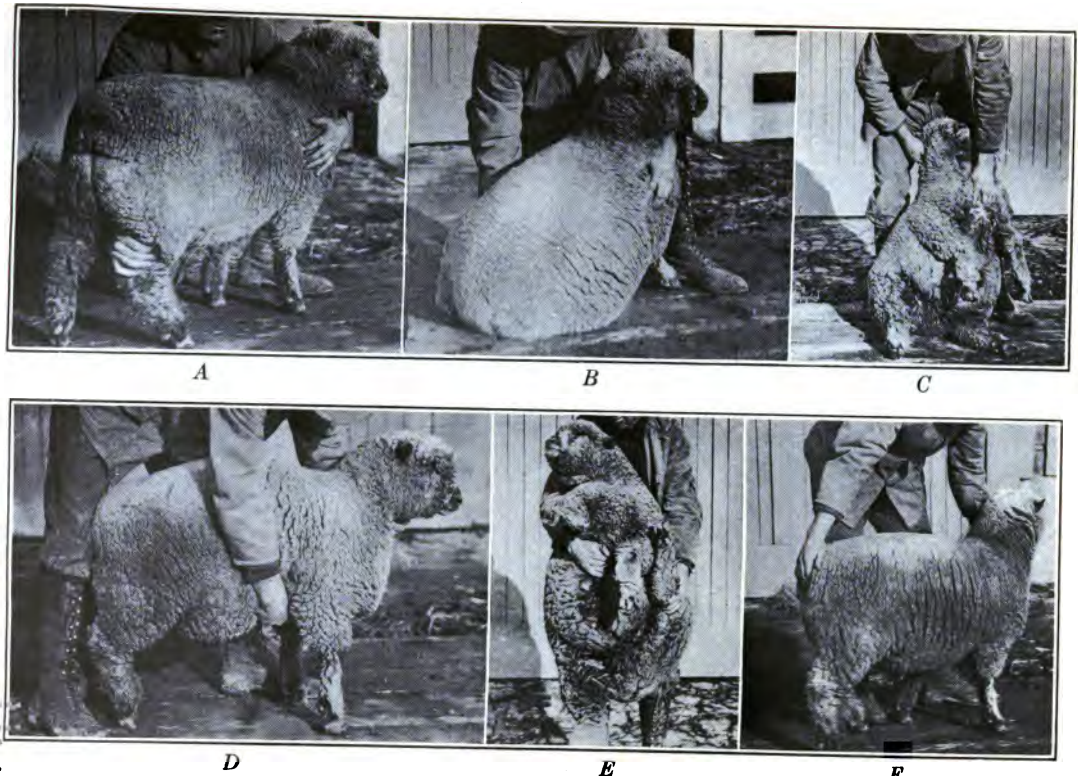


PLATE VIII.

***A*, *B*, and *C*, steps in upsetting a sheep; *D* and *E*, steps in lifting a sheep; *F*, method of leading a sheep.**

and as wide as the wagon box, with sides and ends slatted and about three feet high, is very satisfactory. In loading sheep, it is not necessary to lift them by the wool. Loading should be performed by two persons, one on each side of the animal. The left hand of one loader is grasped by the right of the other underneath the chest of the sheep. Then the other two hands are grasped beneath the flank. In this way a sheep can be loaded easily and without injury.

CHAPTER XVI

WOOL PRODUCTION

THE production of wool is so intimately connected with the raising of mutton that in practically no case has it proved practicable to raise sheep for either mutton or wool exclusively. According to the report of the Tariff Board for the year 1910, the average receipts for each sheep in the United States west of the Missouri River were $2.44. Of this amount, $1.05 was derived from wool and $1.39 from other sources; thus for all the sheep west of the Missouri River, which includes approximately 70 per cent of the sheep in the United States, the income from wool amounts to 43 per cent of the total gross income. This proportion varies considerably when different flocks are compared. It perhaps varies somewhat with the different states of the West, but in no case do the receipts from wool exceed the receipts from other sources. In the states east of the Missouri River the proportion of the income derived from wool is somewhat less, but at the same time it is a large and important item.

The wool industry of the United States is on the whole one of very great importance. This country produces about 325 million pounds of wool, which is worth to the farmers something over 60 million dollars. This enormous amount of wool, however, does not meet the demands of the American people. While the United States produces

about 325 million pounds of wool annually, our mills consume approximately 500 million pounds. This extra amount must be imported from some foreign country. Australia is the greatest wool-producing country in the world, yielding about three times as much as the United States. South America produces about twice as much as the United States, the larger part of which is raised in Argentina.

AMERICAN MARKET CLASSES

In order to obtain an adequate conception of the marketing of wool and accurately to interpret market conditions, it is necessary to study the different grades and classes of wool. The money value of a pound of wool depends on the length, strength, and fineness of fiber; shrinkage and condition; color and character.

Length and strength of fiber.

The length and the strength of the fiber are associated together for two reasons: first, the kind of yarn which demands a long fiber also demands one of considerable strength; second, fiber lacking in strength will break in the process of combing, and the broken fibers must, therefore, class with the shorter wools. On the basis of length and strength, all wools are divided into two general classes, known as combing and clothing wool. The combing class includes the longer wools that are manufactured by the combing process into worsted yarns. The clothing wools are the shorter ones that are manufactured without combing into carded woolen yarns. In the process of making worsted yarns the wool is combed and drawn out in such a way as to make the fibers lie as nearly parallel as possible; while in the manufacture of carded woolen

yarns the process of combing is omitted and the wool is so treated that the fibers are intermingled and interlaced as much as possible. The resulting yarns are, of course, very different. The worsted yarns are hard, firm, and strong, while the woolen are softer, more loose, and not as strong. The worsted yarns are adapted to make smooth-faced light fabrics, while the woolen are better suited for the soft, heavy-fulled goods. The manufacturer of the worsted yarns, therefore, requires a longer and stronger fiber than is necessary for the carded or woolen yarns. In the early days of the woolen business, only the longest and strongest fibers could be combed and therefore the only wools known on the market as combing wools were those of a very long, strong nature, such as would be obtained from pure-bred or high-grade Cotswold or Lincoln sheep. The shorter wools, such as those coming from the Shropshire or Merino breeds, were in those days not considered long enough to comb. Recent improvements, however, in the process of manufacture have made it possible to comb much shorter wool than was formerly the case. There is no hard and fast dividing line between combing and clothing wools, but generally speaking, the finest grades of wool should be at least two inches long in order to be classed as combing. With the coarser wools, a greater length is required and with the very coarse wool, such as would be obtained from pure-bred Cotswold or Lincoln sheep, only those longer than four-and-one-half inches would be considered as combing wools. At the present time, the wool from Cotswolds and Lincolns, as well as from most Merinos, would class as combing wool. The better grades of fleeces from the Down or mutton breeds would also come in this class, although the proportion of clothing wool from these

breeds is decidedly higher than with either the coarse wools or the fine wools. The term "staple" is used in market circles interchangeably with the term "combing."

Grading as to fineness.

With regard to fineness of fiber, wools are most commonly divided into the following classes or grades; fine and fine medium; one-half blood; three-eighths blood; one-quarter blood; and braid.

Fine and fine medium wools are very fine wools such as would be obtained from good pure-bred Merinos. Sheep to produce wool of this class must be of good Merino breeding.

One-half blood wools are such as would be represented by the coarsest of the pure Merino wools. Seldom are the wools of the pure mutton breeds fine enough to come in this class. The sheep producing such wools are usually of Merino stock but with a considerable outcross of native or mutton blood.

Three-eighths blood wools are such as would be represented by good Shropshire wool of the finer sorts. The sheep producing these wools are commonly grade blackfaces on a Merino foundation.

One-quarter blood wools are intermediate in fineness between the Shropshire and the Cotswold or Lincoln. The coarsest grade of pure Shropshire wool might come in this class. It is ordinarily obtained from sheep having a mixture of Cotswold or Lincoln with some of the finer-wooled breeds. It will not require much Merino, however, to make it grade finer than a one-quarter blood.

Braid wools are the long coarse ones, such as would be obtained from pure-bred or high-grade Cotswolds or Lincolns. They carry very little of any other blood.

These terms originated at a time when about the only sheep in common use were scrubs or natives and Merinos. The terms one-half blood, and the like were used to designate the wools obtained from sheep having that proportion of Merino blood. Custom has gradually caused these terms to be used for certain definite grades of wool regardless of the breeding. There are, of course, other terms used, especially to designate sub-classes.

Shrinkage or condition.

When the wool comes from the sheep's back, it contains a large proportion of oil or grease, together with a considerable quantity of dirt, sand, and other foreign matter. The buyer buys grease wools solely for the scoured wool they may contain. The grease and dirt are worth nothing to him. All of this material has to be removed in the scouring process and is a complete loss. The actual percentage of shrinkage varies with the weather, the soil, the method of handling, and with the breeding. Generally speaking, the fine wool ordinarily shrinks between 60 and 70 per cent, while the shrinkage on braid wool

SHRINKAGE OF VARIOUS STATES

GRADES	TARIFF BOARD FIGURES WESTERN U. S	ESTIMATED AVERAGE SHRINKAGE			
		Montana	Idaho	Wyoming	Utah
Fine and fine med. . . .	67.25%	64–65%	67–68%	68–70%	66–67%
½-blood . . .	62.28	61–62	62–64	63–65	61–63
⅜-blood . . .	53.83	55–57	58–60	58–60	57–59
¼-blood . . .	48–08	51–53	54–56	54–56	53–55
Braid . . .		46–48	48–51	49–50	48–49

runs from 40 to 50 per cent. Necessarily this shrinkage must be a tremendous factor in determining the value of grease wools. Especially is this true when wools of the same fineness and from the same ranch will vary several per cent from year to year.

Color and character.

The color of the wool in the grease is one of the earmarks by which the quality of wool is judged. Usually the brighter the wool is in the grease, the better it will scour out. The general usefulness of wool depends on its scouring properties. Wools that are heavy in grease, aged wool, wools packed damp, and wools that contain red soil do not scour well and for this reason they are less valuable. The brightest part of the fleece is the flesh side. Because of this fact fleeces are tied flesh side out.

Another factor by which the quality of wool is judged is character. Wool of high character is that which is regular in fiber and staple, free from kemp, and has a firm elastic touch. Mushy wool, or dry, harsh, brittle wool lacks character. The spinning properties of wool are affected directly by its character. Careless breeding invariably results in wool of low character.

Paint.

Common paint brands injure the wool very much, as paint will not come off in the scouring process. The loss from paint is shown by the following test made by a prominent manufacturer to be about three cents a pound, due to the following factors: labor of cutting off the paint; loss of the painted wool; lowering the grade of the clipped wool because shortened by cutting off the ends; and the danger that all the specks of paint may not be removed,

thus making the wool unsafe to use for the finer cloths. On the ranges sheep must be branded, and there is no brand known that will remain a whole year and yet scour out perfectly; therefore it is necessary to use some brand such as Kemp's Australian Branding Fluid and brand twice a year.

PACKING WOOL

To bring a good price, wool must be tied with paper twine and packed in clean bags. Sisal or common jute twines are very detrimental, as particles of fiber come off in the wool, and since sisal or jute will not take wool dyes, these particles must be picked out by hand. Even then, the danger of leaving some particles is so great that such wool cannot be used for the finest grades of fabrics. Paper twine, on the other hand, sheds very few particles in the wool, and such particles are readily dissolved out in the scouring process. Burlap bags also shed some particles into the wool. In some countries the growers singe the interior of the bags or use bags lined with paper.

Another serious problem to the buyer is the practice of packing all kinds of wool in one sack. Thousands of sacks of wool are marketed containing some fine medium wool, some one-quarter blood, some braid, some tags, and some black wool. The buyer who wants one kind does not desire the others, and when forced to buy them pays a proportionately lower price. Wools of different kinds should be put into different bags and sold accordingly. Especially should the black wool be packed separately. Black wool is worth as much as white and for some purposes more, but a few fleeces of black in a bag will lower the value of the whole, since such wool cannot

be used for making pure white and cream cloth on account of the danger of black fibers.

The packing of wool for market is a subject that has commanded much interest and attention in our western range districts in the last few years. Wool experts have estimated that the wool-producing sections of the United States have been about thirty years behind in their methods of caring for the wool clip. Fortunately, this statement is becoming less correct every year, as much benefit has been derived from the work of wool journals, wool warehouses, and wool experts in educating the range wool-grower in the preparation of his clip for market. There are about three methods of wool packing in use in the wool-producing sections of this country; namely the old method of sacking the wool in the long burlap bags just as it is shorn, the system of grading and baling the wool as is advocated by the wool warehouses of this country, and the system used in the Australian shearing shed.

In the discussion of any of these systems it is necessary to understand the meaning of such terms as grading, classing, sorting, and skirting. These terms have been used synonymously and have caused considerable confusion. In connection with the wool clip these terms are defined as follows: Grading is the placing of whole fleeces into different classes according to their indications as to breed and quality. Skirting is the removal of all stained, damaged, and inferior wool. In the Australian shed this is always done before the classing. Classing is the placing of skirted fleeces into different classes according to their length, quality, soundness, condition, and tint. Sorting is the dividing of the individual fleeces into separate parts according to their various spinning counts or fineness.

This is work that is always performed at the mill, while grading, skirting, and classing are done at the shed.

The old method of sacking wool in a long burlap bag just as it is shorn could be best described as a lack of system. The wool is tramped into the sack while it is still warm. No care is taken to separate the fleeces into classes or grades, or to keep the dirt out. When wool is marketed in this manner, the buyer usually has the advantage of the grower, since the grower does not know what his wool is worth. Buyers purchasing all grades of wool mixed in one sack buy on the basis of the poorer grades. Until the last five or ten years, this method of packing wool was the only one in use in the United States. In the hands of untruthful growers this system is even worse than described above. Such cases as these are reported by the Textile World Record. From one fleece 121 feet of stout rough twine were taken. Twenty-two lamb tails were found rolled in another fleece. A boulder weighing seven pounds was received in a fleece by a Boston firm. Such practices, while not general, are very demoralizing to the wool industry. They are usually prompted by dissatisfaction on the part of the grower.

Within recent years the various wool-warehouses about the country have been making various propositions to the wool-grower. Most of them are something as follows. The warehouse handles the wool on a commission basis, grading, baling, storing, and selling it for the grower. In some cases the warehouse sends a grader and baler to the shearing sheds and the work of grading and baling is done at the time of shearing. In other cases the warehouse receives the wool in the long bag from the grower and does the work of grading and baling at the central warehouse. This method of packing wool is more expensive, but the

returns on the wool are enough to more than pay for the additional cost.

The method of packing wool in the Australian shearing shed is more complex than either of the two preceding methods. In such a shed the fleeces after being shorn are skirted, classed, cooled, and baled. In every operation the object is to lower the shrinkage percentage and to get the fleece to the manufacturer in the best possible condition. Since the Australian shearing shed is new in this country, a more or less detailed discussion of this method will be given.

Australian shearing shed.

The shed is a well-constructed, well-lighted and well-ventilated building in which every possible precaution is taken for the welfare of the fleece, the sheep, and the shearer. The shed is usually built on sloping ground so the floors of the sweating pens, filling race, and catching pens are sufficiently high from the ground to permit the shorn sheep to pass through chutes underneath to the counting or tally pens, which are outside the building. The shed, as indicated by the diagram on the floor plan (Fig. 28), is divided into the following parts: the sweating pens, the filling race, the catching pens, the shearing board, the skirting and classing stands, and the wool room. The floors of the sweating pens, filling race, and catching pens are made of two by fours set on edge with a space between so that urine and droppings will fall through. This feature prevents the soiling of fleeces in case the sheep lie down. The walls, panels, and gates are made of dressed lumber to prevent the tearing of the fleeces. The construction of the sweating pen is such that the temperature can be regulated by ventilation. This part of the shed

is not well lighted, but is in semi-darkness. Most of the light comes into the sweating room from the side toward the shearing board. Sheep by instinct go toward light

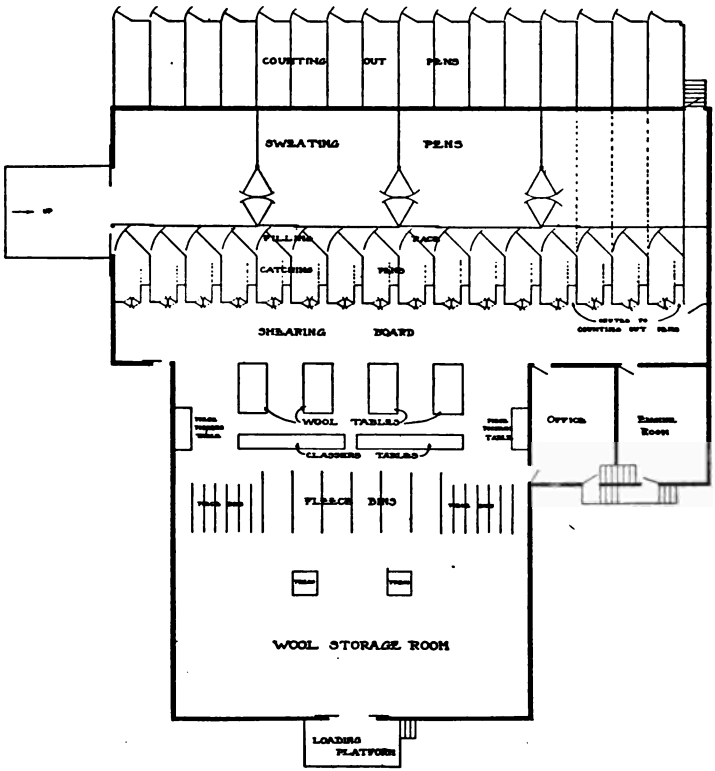


FIG. 28.

and with such a light arrangement they move toward the shearing board with greater ease. The filling race is the alley through which the sheep pass to the catching

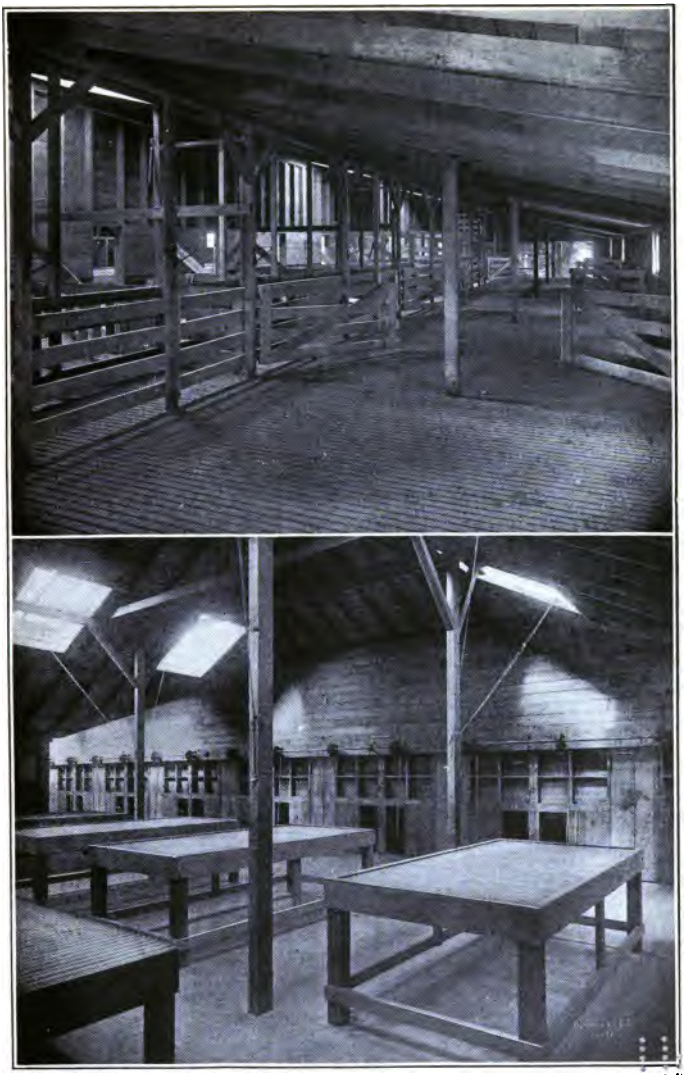


PLATE IX. — AUSTRALIAN SHEARING SHED.

Above, interior of sweating pen with division gates thrown open. On the left is the filling race and the catching pens with the partition between the pens and the shearing board. Notice the 2″ × 3″ slatted floor, all slats ⅝ inch apart. Below, interior showing portion of the shearing board, shearer's tool racks and some of the right and left chutes for the shorn sheep. The double-acting swing doors for entering the catching pens effectually cure careless shearers of the bad habit of legging the sheep. Some wool tables are also shown in the foreground.

pen. In some sheds two shearers use one catching pen and in others each shearer has his own. The door leading from the shearer's stand to the catching pen is immediately back of the shearer and the opening of the chute leading to the tally pens is directly beside it. The shearing board and skirter's tables and the classer's table are all one room. The light of this part of the shed comes from above and is plentiful. The bins for the various classes of wool have doors on the side opposite from the classer's table, which can be locked. This prevents the packing of any wool until the classer thinks that it is sufficiently cooled. The wool room is located back of the bins and is for the storage of wool after it is packed. The counting or tally pens are outside the shed. These are pens to hold the sheep after shearing. At regular times during the day the sheep are here counted and the shearer receives credit on the basis of this count.

According to the Australian method, the sheep before shearing are divided into the following bands: rams, wethers, wet ewes, dry ewes, and hoggets or sheep to be shorn the first time. The reason for this division of the flock at this time is because there are differences in the fleeces that come from these classes of sheep. For instance, the belly wool from the wether is far inferior to that of the ewe, due to the different arrangement of the sex organs. The fleece of the wet ewe, or one suckling a lamb, is inferior to that of a dry ewe. Hoggets have a tapering fiber, and consequently their wool is more valuable, as it will spin to a finer yarn.

On arriving at the shed, each band is placed in the sweating room for two or three hours. The temperature of this room should be such that the yolk, or natural oil of the sheep, will travel outward through the internal channels

of the fibers. Great care is taken not to allow the temperature to become too high, as this will cause the yolk to raise on the outside of the fiber, and leave the wool in an undesirable condition. The object of this sweating is to improve the condition of the fleece, and to make shearing easier.

From the sweating pen the sheep are moved through the filling race to the catching pens. Because of the light arrangement the shepherd and his dog are able to keep the catching pens filled, work which in an ordinary shed requires several men. Labor is thus cut down and less excitement results, as the sheep are handled by the man to whom they are accustomed.

In the Australian shed the work is performed with machines and the shearer's stand is swept after each sheep is sheared. Each fleece is removed in two parts, namely the belly and the main fleece. Belly wool and the main fleece are picked up separately and handled differently. The belly wool is placed in bins according to the length, quality, soundness, and condition of fiber. The main fleece is picked up and thrown on an adjacent skirting table, where two men pull off the damaged, stained, inferior wool, or the skirtings. After skirting, this fleece is rolled up so that the shoulder wool is on the outside. It is then taken to the wool-classer's table for examination. The wool-classer, who is an educated and high-priced man, examines each fleece carefully, and places it in bins according to the length, quality, soundness, and condition of the fiber. Skirtings and loose locks of the fleece that drop off are gathered and taken to the piece pickers' table.

The balers bale the wool from the bins indicated by the classer. No wool is baled until it has cooled. This practice allows the wool to retain its fluffiness even after

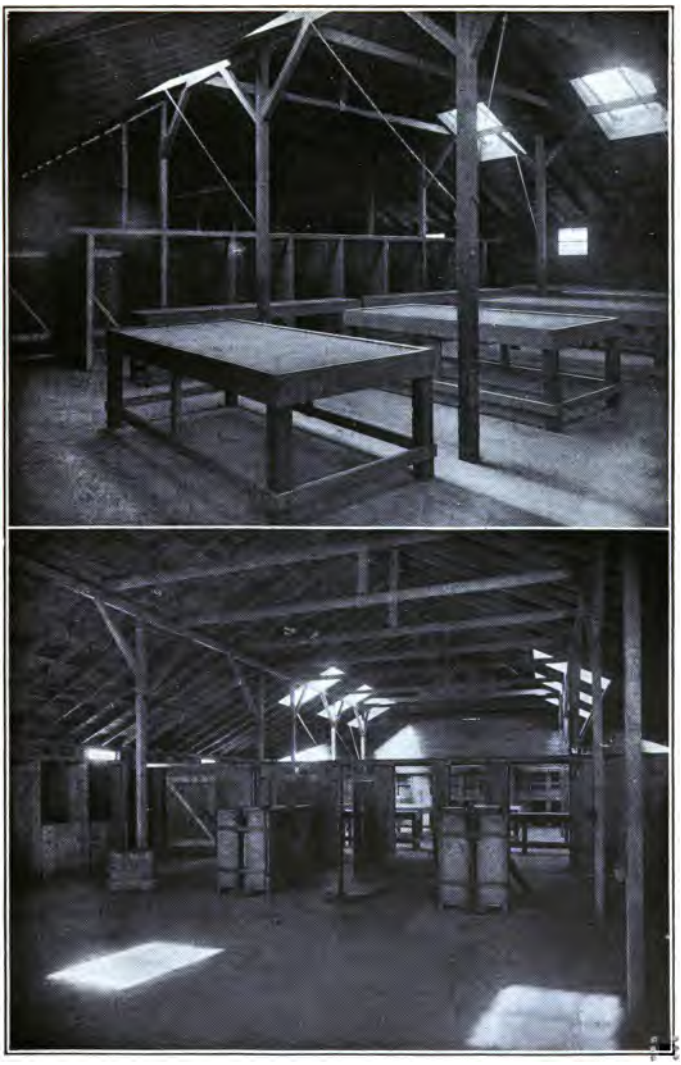


PLATE X. — AUSTRALIAN SHEARING SHED.

Above, the tables in the foreground are skirter's tables. The wool bins are shown at the back of the picture. The wool classer's tables are between the bins and the skirter's tables. The table at the right side and under the window is the piece picker's table. Below, wool baling room. Some of the wool bins are open and some are closed. The numbers on the doors refer to the wool bins.

it comes out of the bale. The fleeces are not tied but are placed in the bale as rolled by the skirters. The bales are marked, showing the number and weight of the bale, class of wool, and the name of the owner.

The most important advantages of the Australian system of packing wool are as follows: Well-arranged catching pens, proper sweating, and good light make shearing easier and prevent the crippling and cruel cutting of sheep so prevalent under the usual system. Sheds having good sanitation, ventilation, equipment, and light draw the best class of shearers. Removal of the dirt, classing, and proper packing put the wool in condition to go on any of the world's markets, whereas the common American pack is salable only on American markets. The classification corresponds with the usual market quotation and thus enables the grower to know the true value of his wool. The classification of the wool at the shearing shed also acts as an accurate and an immediate indicator of any progress that is being made in the breeding and management of the flock and is thus a potent factor for improvement.

PART IV

HORSES

By Carl N. Kennedy

CHAPTER XVII

THE STATUS OF THE HORSE INDUSTRY

IMPROVEMENT in the breeding and management of horses has proven of practical value. Many factors have occurred to depress the price of horses, but a strong demand and a profitable price exist for good serviceable stock. On the other hand, misfits and horses of poorer grade have suffered depreciation. Such results demonstrate that the live-stock industry is making progress and that progress and prosperity go hand in hand.

In the early days the range of the West was an entirely free proposition. The man with the most power could secure the most land, but time has brought about different conditions. The western range has in many places given way to more intensive agriculture and this change has brought new methods and a better type of stock. Even in the places where the range has not been broken up, the ranchers must figure on a higher cost of production than in former years. Stockmen throughout the West realize this condition and as a result are trying to produce a type of stock that the market demands and which will bring a price more proportionate to the cost of production.

In this work of improvement there has been the influence of the management as well as breeding. A definite correlation may be found in the advance of the pure-bred sire and in the better methods of care and feeding.

Either is useless without the other. In this improvement we see the outlook for the future. The pure-bred sire is needed at the head of every commercial herd of stock. Stockmen have depended on the pure-bred for the improvement that has been wrought in the past, and this improvement has now furnished a type of animal that more nearly meets the demand of the market and the requirements of economic production. The maximum of improvement has not been reached and with the improvement yet to come we will have to depend on the pure-bred sire. Grades are good simply because they trace back to animals that were pure-bred, and which have given them their better type. Mongrels and scrubs lack breeding, and therefore lack type. There are also some types that might be termed "scrub pure-breds." These animals are not needed because their only prepotency is along the lines of the scrub type. Coupled with improvement which must come by the use of better sires, there must also be the improvement that comes by better methods of management. In the correlation of these facts lies the permanence of the horse industry.

NUMBERS AND VALUES

The numbers of horses and mules in the United States have practically doubled in the last fifteen years. The number is now approximately 25,000,000. In the last five years of the period mentioned there has been no great change, but in the first ten years the increase was very rapid. This increase in horse production was proportionately faster than the increase in the population, and this may be a reason why there is at present an apparent standstill in regard to the numbers. The automobile

and the motor truck have also exerted a large influence and to them the credit is partly due for educating the buyers to select only the better class of horses. Motors have especially displaced a large number of light horses. If history repeats itself, and it is likely that it will, the type of horses will soon readjust itself to the demand, which is at present strongest for the draft horse and the light horse that is strongly built, and therefore serviceably built for draft, army, or any work that requires constitution and wearing ability.

The value of the horses in the United States has kept in close pace with the number. In the period when horses were increasing in numbers, they were also increasing in price. In 1897 the average price given by government authorities was $31.50. In 1916 the value was $101.60, which was a decrease since 1911, when the value was given as $111.46. Of even greater importance is the value of the horses in different sections. In the more thickly settled states, where the agricultural development is greater, the horses are of higher value. There are two reasons for this situation. In the sections of greater agricultural development, the food is of such a nature that the horses produced are of higher value, and secondly, as the West is more of a breeding center, there is less local demand for commercial stock. These two points may be illustrated. The value of horses produced in grain and farming sections is higher than those produced under range conditions, as the former are invariably larger and better grown, due to heavier feeding, and therefore of more value. The West with its undeveloped lands raises many horses with but little or no grain. A study of horse values shows a direct ratio existing between the agricultural development and the value of the horses. Fertile

land and good crops mean valuable horses. The second reason for lower prices in the West is due to it being a great breeding center, as is illustrated by figures compiled from the 1910 census. This gives the number of colts produced in each state for 1909, as well as the mature horses. All horses over fifteen and one-half months were considered as mature horses in this classification. These figures show that there were 9.9 colts produced in the United States for every 100 mature horses. The sections of states were rated as follows: 14.2 colts in the Mountain states; 11.3 colts in the Pacific states; 10.5 colts in the North Central states; 9.2 colts in the South Central states; 7.6 colts in the South Atlantic states; 5.0 colts in the Middle Atlantic states; and 2.8 colts were produced for each 100 mature horses in the New England states. In proportion to the numbers of horses, the West can claim to be the greatest producers. Prices, therefore, so adjust themselves that it is profitable to ship horses from the producing to the consuming centers and pay the attendant expenses of shipping, buying, and selling.

EXPORTS AND IMPORTS

Previous to the European War, the United States had been importing about 10,000 horses annually, and their estimated value was about $285.00 a head. Of this number, approximately 3000 were pure-bred, which were imported for breeding purposes. Their estimated value at the port of entry is given at $400.00 to $500.00 a head in spite of the fact that the larger number of them were sold for several times this price. There is a tariff on all horses imported to this country, except those brought in for breeding purposes. Since the beginning of the European War, the importation of horses for breeding purposes

from the European countries has been largely shut off, and hence imported horses are not sold by the stallion dealers to the extent which they were. The home-bred horse has a better opportunity. In some ways it is good that such has been the case, for it has brought the American horse before the public in a way that could not have been accomplished if the war had not occurred.

The exportation of horses previous to the European War was from 30,000 to 40,000 head yearly. These were mostly work stock, and went to various countries. Since 1914 the number has increased to a large extent, and during the first thirty months 853,116 horses were exported. It is certain that the horse market is based largely on the European demand at this time. The number of mules exported under normal conditions is about 4000, but since the war this number has been largely increased. This exporting of horses has had a marked influence on the demand, as the number of exported horses and the price of them largely controls the price of horses for local use. Under the conditions which will exist after the war, we may expect to export large numbers for commercial and probably some for breeding purposes. Following the Boer War, when a large number of our horses were used for cavalry purposes, we supplied the European countries with a larger number of horses than we had been doing previously. This will mean that our export trade, for the near future at least, is well assured.

HORSE-PRODUCING SECTIONS

The entire West is a horse-producing country, but it may be subdivided into a great number of different sections, each one more or less distinctively peculiar to itself. The largest users of horses, and also the largest

producers, are the farmers of the Wheat-Belt. In the tending of the summer fallow, the plowing, the cultivating and harvesting of wheat a great number of horses are used. These horses, in order to be useful in pulling heavy machinery, are largely draft horses of substantial character. The surplus horses from these regions are very marketable, and are sold to a large extent in the East and in the cities. Large numbers of the good draft sires have been used in these sections in past years, and good stock is produced, although the Wheat-Belt is often handicapped by the lack of a large amount of pasture. In some sections this is overcome by using adjacent range, or land which is not suitable for the production of wheat, but generally speaking the wheat ranches must support their horses largely on grain and hay.

The irrigated valleys produce many good horses. In these valleys the farmers do a large amount of farm work, and therefore require draft horses for this purpose. Usually adjacent to the irrigated valleys there are pasture lands which are supplemented by cultivated feed and irrigated pastures. The horses produced in these sections are large and growthy, and therefore good marketable stock.

The homestead farmers form another class who are raising some horses. These men, as a rule, are raising a poor class of horses, for they usually lack the capital, and also lack the land for the production of any large amount of feed, and therefore they have neither the feed nor the opportunity to raise a large amount of high class stock. Occasionally, however, a homesteader will be found who is developing his land and raising some grain, and these will more nearly correspond to the Wheat-Belt producers.

Other sections which are different from the ones mentioned and comprise a division presenting different problems are the valleys of the North Pacific slope. In these valleys the climate is humid during a large part of the year, and as a result there is more or less abundant pasture. In connection with these pastures a large amount of clover and vetch hay is raised, together with barley and oats. These good feeds, together with the use of high-grade sires, make these valleys producers of a valuable class of horses.

The other large division of horse-producers in the West is that made up of the range-men. On the range a large number of the horses are produced without any supplemental feed. In fact, the main reason for raising horses is that they require less hay for winter than other stock. A large number of the range-men are raising more cattle and sheep than horses, especially where they possess valleys to raise winter feed, but it is unlikely that the range horse will be entirely displaced. These horses are of a smaller class, the best of them seldom weighing over 1200 pounds. The reasons for the small size are feed conditions, and the inability of heavy draft sires to take care of themselves on the open range. A large proportion of the range horses are raised by the cattle-men and sheep-men in connection with their other stock. These horses are better fed and attain more size than those raised by the exclusive horse-producers. These animals supply the saddle and work horses needed by the ranchmen and some excess which is marketed.

In all of these sections, the factor which is most favorable to a large number of horses of better quality is an abundance of well-tilled land devoted to grain and hay. Generally speaking, the higher priced the land, the more

numerous and valuable the horses, excepting in fruit and other special areas. Where the land is of low productive value, poor horses are found, and only very few in proportion to the area. In those fertile valleys of the West where the best crops are grown, the best horses are raised. The poorer horses are found on the ranges and in the rougher country. The kind of people has much to do with the kind of horses. The best farmers, like the better horses, are usually found on the richer soil.

CHAPTER XVIII

THE WORK HORSE

It has been estimated that two-thirds of the horses in the United States are work horses, and that a sum equal to two-thirds their value is needed every year to pay for their feed and care. Therefore the work horses of the country are an expense which must be offset by their profitable employment. In order to be kept at the highest state of efficiency as well as to be maintained economically, horses must receive proper feed and care. In no other class of farm animals is there so large an average investment, and therefore no other that offers so large an opportunity for saving.

FEEDING WHEN AT WORK

In the feeding of a hard-worked horse, the essential points are to give feeds containing a large amount of net energy, and of such nature that they will agree with the digestive system of the horse under conditions of severe work. Most of this energy must be obtained from the grains, as the hays are too bulky to supply the net energy needed. From the standpoint of energy alone, corn would be best, with barley second, and wheat next, but when the effect on the digestive system is taken into consideration, it is found that oats are distinctly the best feed, although horses may be successfully fed on either corn or barley. Such hays as clover, vetch, and alfalfa,

which are especially good for the growing horse, also contain a considerable amount of energy, and from this standpoint would be good for the hard-worked horse, but because of their washy effect, they are less desirable than some of the less nutritious hays, such as timothy. Timothy does not contain a large amount of digestible nutrients, but because of its favorable influence on the digestive system of hard-worked horses, it has long been the common practice to use it almost exclusively and depend on grain for most of the energy or digestible nutrients. In some sections rolled barley and wheat hay are used extensively. Either of these feeds has a tendency to cause impactions. In using feeds of such nature, it is desirable to use some laxative feed, such as alfalfa hay or bran, which will tend to keep the bowels open and have a favorable action on the digestive organs. The demands of the work horse for protein and mineral matter are comparatively small and there are very few feeds commonly used which do not contain a sufficient amount of these nutrients. A slight excess of protein will not be harmful, for it may serve the same purposes in the body as carbohydrates and fat; that is, for the production of energy. There is a limit, however, to the amount of protein which may be successfully fed. All of the nitrogen taken into the body must be taken out by the kidneys, and an excess of protein will produce disorders of these organs. The amount of protein which may be fed to a horse varies greatly with different individuals, and there is no way to tell in advance just where the limit lies. The feeds which produce the largest amount of net energy or digestible nutrients are the grains and mill feeds, as corn, barley, oats, bran, and oil meal, and it is on such feeds that the horse must largely depend for the energy to perform hard

PLATE XI. — CITY, RANCH, AND STABLE.

Above, a city team that is a walking advertisement; center, mules have given especial satisfaction in big teams on the wheat farms; below, a well-arranged sale stable with neat stalls and a wide alley for showing horses.

work. Such hays as alfalfa, clover, vetch, or the grain hays furnish a fair amount of net energy but not usually enough to supply the horse when he is working hard. Timothy, wheat, and wild hay furnish but very little net energy and the straws almost none. Among the feeds that are usually high in protein are oil meal, bran, and oats, also alfalfa, clover, and vetch hay. Barley and the cereal hays are rather low in protein, while timothy hay and corn are very low. The feeds that are high in protein are also usually rather high in mineral matter, which is an important point with young stock.

The work horse has need for feeds supplying a large amount of energy rather than protein. In order properly to supply this, a horse at heavy work will require from one and one-quarter to one and one-half pounds of concentrates and from one to one and one-quarter pounds of hay to 100 pounds of live weight. A ration often used for 1600-pound dray horses consists of twenty-two pounds of oats and sixteen pounds of timothy hay a day with two or three pounds of wheat bran and less grain on Saturday night and Sunday. The grain is cut down and the bran fed on Saturday night and Sunday in order that the horse will be lightly fed when idle and that the bowels may be open so that he will not be so likely to be affected with azoturia when put to work. The amounts listed are about what the horse will consume when the hay is timothy, but with clover or alfalfa the amounts must be limited, since the horse given all he wants will eat entirely too much hay and too little grain.

FEEDING WHEN IDLE

In the case of mature horses maintained in idleness, the needs of the body are for maintenance of heat and the gen-

eral wear of the body tissues. They do not need the large amount of net energy which is required when the horse is doing physical work. Since the body has already attained full growth, protein and mineral matter will be needed only to make up for the loss due to the natural wear and waste of the body tissues, while the larger part of the need will be carbohydrates and fats, which are heat-producing. Such bulky feeds as straw and the coarser hays, that would not be suitable for work horses, may be used to advantage in this case. It has been found that the energy required for mastication and digestion of wheat straw is about equal to the total energy of the feed. Therefore, the energy which can be derived from wheat straw and converted into actual work is very small, in fact so small that such feeds have little value for hard-working horses. In the case of an idle horse, however, where the chief need of the body is for heat-producing feeds, it is found that this energy from the wheat straw, which was used up in its own digestion and assimilation, is converted finally into heat, and thus serves to maintain the temperature of the body. Thus it is that these foods with very small amount of net energy may be used to advantage in maintaining idle horses. Another point in favor of using bulky feeds for this purpose is that the total amount of digestible nutrients required to maintain a horse in idleness is comparatively small, and if given in concentrated form, such as some of the rich grains, the horse will not produce enough bulk to satisfy the appetite, and would be very ravenous and not thrifty. Furthermore, this small quantity of rich food would be likely to cause digestive disorders.

The feeding of the cheaper feeds to idle horses has another decided advantage. Work horses are not expen-

sive for upkeep while they are at work, as feed is converted into energy in a very efficient manner, but the expense runs up on account of the large amount of time which the average horse is idle. On the average farm, more saving can be made in cost of horse power by feeding cheap feeds when the horses are idle than in any other way. This saving can be made by the use of more hay and straw when the horses are idle, instead of feeding them on the same grain ration, whether they are at work or not. A larger use of pasture can be taken advantage of than is common on the average farm. On the other hand, when a horse is working, a larger proportion of concentrates should be fed than under average conditions. The result of the feeding system as commonly practiced is that the horse is fattened during the season when he is not at work, but is losing flesh when he should be at his best.

The work geldings in good flesh in the fall will winter very well if given the run of a straw pile with a feed of eight to ten pounds legume or cereal hay each a day. Horses that are kept up will winter on good cereal hay and perform all the light work without additional grain, but they will consume from one-and-one-half to one-and-three-fourths pounds of hay to 100 pounds live weight. Very little grain is necessary for idle mature stock.

PRINCIPAL FEEDS

Barley is much used throughout the West, due to the large yield to the acre, especially in the dry-farm sections. It is usually fed steam-rolled. Barley supplies large amounts of energy, but care must be taken in its feeding, as it is somewhat constipating, and when fed with wheat hay considerable trouble with impactions may be expected.

Wheat is not as largely used as some of the other feeds, due to its higher market value for other purposes. When fed, it is usually ground, and makes a fairly satisfactory substitute for barley or oats. It has about the same digestive effect as barley. Horses must be gradually accustomed to wheat before it is fed in any large amounts. A large feed of wheat may kill a horse not used to it.

Oats are the standard grain feed of horses throughout the country. This is due to the normal effect on the digestive system, and the well-balanced amount of nutrients which they contain. Very few digestive disorders are involved in the feeding of oats, and it is this that makes it the standard feed, especially in the hands of unskilled feeders.

Corn is not largely raised in the West but when available it forms a highly nutritious feed, supplying large amounts of energy. Corn contains a relatively small amount of protein and hence needs to be balanced with feeds containing more protein when used for growing stock or brood mares. On account of the extremely concentrated nature, care should be taken in the feeding of corn to avoid digestive troubles.

Oil meal is used to balance up the feeds containing barley or wheat. It is laxative in its general nature, and provides a large amount of protein, thus making it a good supplemental feed, especially with rations that would otherwise be rather constipating.

Wheat bran is used in the same general way as oil meal, but is more bulky, and makes a very good feed to use in connection with barley. The laxative effect of the wheat bran offsets the constipating effects of the barley as well as furnishing more protein. Bran is a very safe feed and, like oats, causes little digestive trouble.

Oat hay, when well cured, constitutes a very satisfactory feed, especially for the wintering of stock. It has a normal effect on the digestive system, and is a fairly well-balanced feed. It is especially satisfactory for brood mares and colts and is used to some extent for work horses.

Wheat hay is largely used throughout all the wheat-producing sections. It is a very valuable feed, and has a high energy value. The most serious fault is that it is somewhat constipating, especially when fed in connection with barley, as suggested above. This fault may be overcome, however, by feeding in connection with bran, alfalfa, or some other laxative feed. Wheat hay, morning and noon, and alfalfa at night make an ideal combination.

Barley hay is not so extensively used as wheat hay, but meets the same general requirements and also many of the criticisms. The beardless barleys are generally used for hay purposes.

Rye hay is largely used throughout the homestead areas, as they are usually high in altitude, and therefore need a drought- and frost-resisting crop. Usually rye is somewhat constipating in its general nature, and therefore must be fed with care. It is not considered advisable to feed over one-half rye if it is possible to obtain other feed, although many will feed entirely on rye hay and get along satisfactorily with it. The difference will depend largely on the cutting and on the individual horses.

Wild hay is used in many sections, and is very well liked. It is usually normal in its general effect on the system and is fairly nutritious.

Timothy hay is considered as the standard hay for all work horses. This is not due to its large amount of nutrients, but to the normal effect which it has on the horse's digestive system. Timothy contains a large

amount of crude fiber, but when well cured is palatable. It is usually high-priced and is not a good hay for growing stock unless supplemented with other feeds. Horses do not eat as much timothy as alfalfa, vetch, or clover, which is an advantage in the hands of a feeder who persists in keeping the mangers full regardless of the needs of the horse.

Cheat hay is largely grown in some of the western sections, and is used in place of timothy. It is somewhat more woody in its general character, and is not well adapted for growing stock. When used for work horses, the energy needed, as in the case of feeding timothy, must be largely supplied by the use of concentrated feeds.

Alfalfa hay is standard throughout the West. The first cutting is preferred for horses, as it is of a less laxative nature, and therefore does not have as washy an effect. Usually it is considered advisable to feed some other hay with alfalfa, but in some sections where the horses are used to it, very fair results have been attained when the entire feed is alfalfa. On account of the large amount of protein involved, there is occasionally some trouble with kidneys.

Clover hay is not as rich in protein, but practically as rich in digestible matter as alfalfa, and when well cured it is an excellent hay for growing stock. Clover is very often dusty if improperly cured and therefore care must be taken in the feeding of it, especially with work horses, in order to prevent any trouble with the wind. It is also laxative and somewhat washy for hard-worked horses.

Vetch hay is very laxative for horses, especially when it is cut when somewhat immature, which is the best stage

for other stock. When mixed with oats in the form of vetch and oat hay, it provides a very satisfactory ration for the wintering of stock, but when vetch comprises a large proportion of the hay, it is too laxative to be fed to work animals under usual circumstances.

The straws through the West consist largely of wheat, oats, and barley. Of these oats is considered the best, although some wheat straw is good feed for the wintering of stock. Straw throughout the West could be more largely used than it is at present. The use of straw for the wintering of work horses as a supplement to some good alfalfa or clover hay could be made one of the big factors in cheapening the cost of horse power.

In the western states, pastures vary from alfalfa to bunch-grass. Most of the grasses are very nutritious, except in some of the coast regions. In most sections, some use is being made of the range in cheapening the cost of horse power in wintering and also in the keeping of idle horses. Growing horses require other feeds on many of the pastures, especially in the winter.

INFLUENCE OF LOCATION

The section in which the horses are used largely influences the feeding. In the sections where alfalfa is produced, it is fed exclusively except when wheat and barley are raised in addition. In this case a very satisfactory ration is made of the rolled barley for the grain and alfalfa and wheat hay for the roughage. For light work, the wheat hay and alfalfa may make the sole ration. In the Wheat-Belt the principal ration is rolled barley and wheat hay. This constitutes a very satisfactory ration, except that it is somewhat constipating and

therefore may cause sickness and loss due to impactions. The ration is benefited either by feeding some wheat bran, oil meal, or alfalfa hay. In some of the more remote sections, the horses work largely on either grain hay or wild hay. Under these conditions, they cannot perform the amount of work that they could if fed on more concentrated feeds. In the humid valleys of the north coast, a large amount of oats is fed with clover, timothy, cheat or grain hay. These make ideal feeds for horses, and many of the best horses are produced here. In the northern irrigated valleys, oats and some barley usually comprise the grain feed, with timothy, timothy and clover, or alfalfa for hay. In the southern valleys, especially California, the horse feed is largely barley with alfalfa or cereal hay.

WATER, SALT, CONDIMENTS

The principal point to consider in the watering of horses is that they receive their water at regular periods, so as not to drink too much. It is usually better to water before than after feeding, but regularity is more important than the time of watering. Salt should be kept before the horses where they can have access to it, or it should be given to them often so that they will not desire too much of it at one time. Condiments are feeds that are used for special purposes, such as special stock foods, and are used to tone a horse up for some special purpose or to keep him in good condition. Usually these are not advised, as the best condiment that the horse can have is good feed and care. Occasionally a worm medicine or something of the kind may be needed, and if so, should be prescribed by a reliable veterinarian.

FEEDING THE CITY WORK HORSE

Two feeds are used as a staple base for all city horse feeding operations. These feeds are oats and timothy hay. The packing companies usually feed their horses five times daily, and if any horses are called out irregularly, such horses are fed before going out. Oats and timothy hay constitute the regular ration. A hot bran mash is given on Saturday night or Sunday morning with only one or possibly two light feeds of grain during that day. Most of the large transfer firms in all the western cities feed their horses in a similar manner. The greater part of the hay is bought from the irrigated or dry land sections, as it is more uniform in its quality. Certain firms use some barley and considerable bran, but most of them consider that even if the barley is cheaper, it is more expensive in the long run than oats, as it causes more digestive troubles. The customary manner of feeding is to give oats as the main ration, together with timothy hay, and on Saturday night a hot bran mash, with very little feed except hay on Sunday. The small amount of grain on Sunday is in order that the horses may not be troubled with azoturia when taken out on Monday morning. Some of the larger firms are using some mixed hay, but as stated before, timothy forms the chief roughage for all city work horses. Horses that are hard-worked will need from one-and-one-fourth to one-and-one-half pounds of grain and from one to one-and-one-fourth pounds of hay to 100 pounds of live weight a day.

FEEDING THE DRIVER AND SADDLER

Unless the driver or saddler has regular exercise, which is not usually the case, it is impossible to feed a large

amount of concentrated grain, as they will become too fat and out of condition. On the other hand, if they are fed a large amount of hay and not exercised, they will be poddy and soft when taken out. The feeds largely used are oats and timothy supplemented with bran, and these must be regulated according to the work which the horse is doing. Under farm conditions, the feeding of the light horses is somewhat easier, and the main problem is how much pasture to use and when to use it. If an animal is to be worked every day he would need pasture only for a few hours occasionally for a change. On the other hand, if the washy effects of the pasture were not noticeable, then he should be turned out whenever he is not in use. This class of horses on the farm is used with little regularity, and when not used, the farmer cannot find time to take an animal out merely for exercise. Pasture with a certain modification is usually the most satisfactory system of management. Ordinarily the horse has the liberty of the pasture, and when it is known beforehand that he is to be used, he is put in the stable the evening before, or when he is not to be used until evening, early that morning. Oats given in four-quart amounts at the regular feeding periods is best under these conditions, but the hay should be limited. Legume hays should not be used, especially soft, washy cuttings, but rather some woody carbonaceous hay, such as timothy, which has become quite ripe before cutting. Twelve hours with nothing but oats and a little dry hay will usually put the horse in fair working condition. When it is impossible to give the horse a few hours in the barn before using, it is necessary to handle him carefully when he is first taken out. In this case, the driving or riding will have much to do with the results obtained. From two to

five miles at a walk will put most horses in a condition for good work, provided they are walked from the start, but if they are started off at a fast gait, and begin to scour, the walk will not stop the trouble. Late in the summer and in the fall, the driving horse may run in the pasture and stubble fields and be in fairly good working condition with no great tendency to scour. It is possible to keep the horses in the barn all the time, and by skillful management, plenty of grooming, and daily work put them in condition to look better and do more driving than the horse that has been in pasture. The conditions mentioned, however, are impracticable on the farm, except in rare cases.

GROOMING

Horses that are running in the pasture do not require grooming, but do well without it, and horse-men frequently wonder why it is necessary to groom horses in the stables. It is not the stabling that makes it necessary to groom a horse, but it is the high feeding, and active work. This is proved by the cavalry horses, which require grooming, even when living in the camp, just as much as horses which are kept in stables. Fast or active work increases the secretion of the glands of the skin, and the greater the action of the skin, the greater the attention that must be paid to it. The horse which is not at heavy or fast work does not require much grooming, because the excretions of the system are carried off mainly by the bowels and kidneys; but during hard work much of the excretions must be carried off through the pores of the skin. Grooming is not a mere matter of external cleanliness, but of the perfect condition of the skin and blood.

The skin is composed of two layers; namely, the outer or

upper layer called the cuticle, which is hard and insensitive, and the inner or under layer called the cutus or true skin, which is sensitive and vascular. The cutus or true skin is thick and full of blood vessels and nerves and from it grows the layer which forms the cuticle or outer skin. Each cell is originally filled with moisture and as the moisture evaporates, the cells become flattened and are laid in series, one over the other, forming the cuticle or outer skin. The cells of the outer skin are constantly being worn off and are replaced from below by new cells formed by the cutus or true skin. The sweat glands in the skin secrete perspiration which is exuded through a pore terminating in the surface of the skin. Each gland is minute in itself, but collectively they form one of the largest secreting organs in the body. The oil glands open partly on the surface, but mostly into the tubes of the hair. Each hair tube is furnished with one or more of these glands. Wherever there is much friction or motion in the skin, the old glands are very numerous. The healthy or unhealthy condition of the skin is very readily shown by the appearance of the hair. If the skin is unhealthy, the coat is harsh and dry. If the skin is not properly cleaned, the dirt remains, not merely on the coat, as many think, but in the system, due to the clogging up of this very important set of drains. The general health of the animal must in consequence suffer.

In order that grooming should produce the desired effects of removing the scurf and worn-out cells as well as cleaning the horse, it is necessary that the skin be cleaned thoroughly by a good bristle brush well laid on. The other necessary instruments are a curry comb, mane comb, and fiber brush. By fiber brush is meant one which is made of stiff vegetable fiber and not of hair bristles. The curry comb

need not be largely used, except when the horse is particularly dirty or sweaty, when it will be needed to get the hair in condition so that fiber brush, and later the bristle brush, will thoroughly clean out the hair. A satisfactory system of currying is to start with the curry comb and fiber brush and thoroughly go over the animal with these two instruments, and then follow over the animal with the fiber brush, followed with the bristle brush, since the latter will clean out the skin better than the fiber brush, although it will not loosen the particles as well. The hair on the legs must not be neglected, but must be thoroughly brushed out. Otherwise this region will become impaired and grease heel, mud fever, or other ailments may result.

The mane and tail should not be allowed to become too heavy, but should be thinned out occasionally by pulling or combing. On driving and saddle horses, the foretop should be kept clipped short back to about three inches behind the ears. Some men clip the foretop on draft horses, and also clip their manes, but it is usually not customary. When the mane under the collar is clipped, the short stubby growth very often irritates the neck more than the long hairs. This is especially true if it is not kept short.

BLANKETS

The use of the blanket is to be recommended. In the summer the blanket should be very thin. A light burlap, little heavier than a fly net, is satisfactory. In the winter a heavier one may be used, but not too heavy, for there is more danger of the animal catching cold if he is accustomed to a heavy blanket in the stable. A storm blanket should be provided for the protection of the horse when obliged to work or stand out in bad weather. For draft horses,

a waterproof canvas blanket is very satisfactory. For hot-blooded horses, it is necessary to have a woolen blanket under the waterproof canvas, as they are more likely to chill. When a horse returns to the stable in a sweaty condition in cold weather, it is well to put on a light porous blanket, and then a heavier one on top, of some other material. These blankets should be left on for a short time to draw out the moisture, and then the regular stable blanket put on. If such blankets are not at hand, the horse should be put in a protected part of the barn, where there will be no draft, and rubbed down until he is about dry, and then the usual blanket put on. If the stable blanket is put on when the horse is in a sweaty condition, it will become wet, the horse will not dry out in good condition, and very often a cold will be caught in this manner. When the horse is in the stable and dry, one should not attempt to blanket him for warmth, but rather to keep the coat in good condition, short and glossy, and free from dirt.

CARE OF HARNESS

Harness is the horse's most expensive equipment, and it is all important that this material be kept in proper condition. A good harness, if well made and properly taken care of, will last for a long period under average work. On the other hand, if it is left to dry out, rot with the sweat, and break to pieces, it will soon be destroyed. On well-managed farms the harness is repaired completely at least twice each year. It is taken apart and thoroughly washed with soap and water, dried, and then oiled with neat's foot or with prepared harness oil. The latter is more popular at the present time. At the time of oiling the

harness, it should be thoroughly repaired in all parts, and if this is done, but little trouble will occur during the year, except for the occasional breakage. A home repairing kit consisting of a sewing outfit, riveting machine, together with leather snaps and buckles will enable the average man to repair most of his harness at home.

In the fitting of the harness, the most important point is to see that the collar fits correctly. If the collar is too short, it cuts the wind, throws the pressure too high on the shoulder, and causes sores on the top of the neck. On the other hand, if it is too long, it throws the pressure a little low, and causes a bruising of the shoulder points, and may also cause a bruising of the withers by pulling back too far on the top of the neck. If the collar is too narrow, it will pinch the neck, irritating the shoulder, and will also throw the pressure too far in on the shoulder. On the other hand, if it is too wide, it will throw the pressure too far out on the side of the shoulder, causing the collar to slip back and forth and make sores. The usual difficulty in fitting the collar is that it is bought to fit when the horse is in good condition before going to work, and as soon as the fat is gone, the collar is too loose. Therefore, special care must be taken in fitting horses to see that they are snug, but still do not pinch in any place. If the collar does not set to the horse's neck, it is very often satisfactory to soak it overnight, then place it upon the neck, fitting it closely with the hames and let it mold itself to the horse's neck. This will usually cause a very satisfactory fit if the collar is the right size.

If it is necessary to use collar or sweat pads, it should be to change the fit of the collar or to change the general seat of the pressure, as collar pads are usually hot and soft, and stick to the skin, causing irritation which would not

be the case with a properly fitting collar. The pad, if used, should be long enough to come within two or three inches of meeting at the bottom of the collar, otherwise it will irritate the points of the shoulder and make them sore. The top pad should be hard and firm, and not of soft leather that will wrinkle and irritate the neck.

The remainder of the harness should be fitted as carefully as the collar, although it is easier to secure a good fit. However, many farmers will work with the back band six inches out of place, or with hold back straps that hang down so low that the horse will stick his feet through them at every opportunity. In the fitting of single driving harness, it is especially necessary that they be neat and well kept. The appearance of the horses is greatly enhanced by well-fitting harness. Everything should set snug, but not so that it will bind on any place.

THE HORSE AT WORK

One of the common ailments of horses at work is sore shoulders. Sores on the points of the shoulders are caused by the collar usually being too wide or too long. The remedy is to put on a different collar or use a pad. The sore may be treated with gall cures, of which many are sold by harness-makers and druggists, and usually are fairly satisfactory. A remedy which is largely used is air-slaked lime or flowers of sulfur on the shoulders in the morning and at noon, and occasionally sprinkled on the shoulder while the horse is at work. This acts similarly to talcum powder, and causes the collar to slip easily, and not irritate the shoulder as it would normally. Then at night, a treatment of the gall cure may be put on if necessary, or the shoulder if in good condition may

be washed off with a solution of salt water, which will tend to harden the shoulder to the work. Small sore bumps or collar boils may be found along the side of the shoulder. These may be caused by ill-fitting collars, but they are more often due to derangement of the system, which is very common in the summer. If the collar fits properly, then it is necessary to clean up the animal's system. Some good can also be accomplished by treating the bumps as indicated before, and also occasionally it will be necessary to cut out a hole in the pad over the sore, and in this way it can sometimes be cured. A collar wide at the top works back and forth, and thus irritates the top of the neck. These sores are also often caused by poorly fitting pads, or too much weight on the neck yoke. Sores on top of the neck are very difficult to treat successfully. Prevention is the best cure. If the horse is subject to such afflictions, always use a stiff, smooth pad on him and see that the collar sets properly. Be very careful about excess weight on the neck yoke. All forms of two-wheeled machinery are likely to injure the horses' necks. Tongue trucks are a great benefit wherever they can be used. In any of the treatments given, rest will accomplish much, especially if it is accompanied by proper treatment.

A disease which often affects work horses is azoturia. This is often called Monday morning sickness, due to the fact that it is an affliction which troubles the horses when they have been off work and are suddenly put into work again. It is usually due to heavy feeding when idle. It is first noted by the fire and life with which he first left the stable giving way to dullness and oppression as shown in heaving flanks, sweaty condition, dilated nostrils, and pinched loin. The muscles become swollen and rigid and the subject moves stiffly or unsteadily. If any of the

conditions are noticed, the horse should be stopped at once and blanketed, and put under the treatment of a competent veterinarian. While the veterinarian is coming, it is beneficial to put blankets wrung out of hot water over the loin. If the veterinarian cannot be secured quickly, the horse should be given a dose of bromide of potassium (four drams) and sweet niter (one ounce); drench slowly and carefully, giving the horse time to swallow. The horse should not be moved, but left where one sees the first symptom. If none of these remedies is available, the horse should be allowed to stand until he has recovered, which usually will be in a short time if stopped at the start. If the horse is not stopped at once, he will usually "go down" and there is a high mortality when the disease advances to this point.

The speed and the amount of the load at which a horse works influence to a large degree the efficiency of the horse power produced. A draft horse working under a heavy load can do the work more efficiently when walking at the rate of two to two-and-one-half miles an hour than at any other gait. Therefore, it is false economy to speed the horse up and put on a light load, expecting a larger amount of work. When the speed is increased above that mentioned, the efficiency of the horse power produced is decreased accordingly. When the horse trots at the rate of ten miles an hour, the amount of work which it is possible for him to perform is decidedly decreased, being about 10 per cent of the maximum amount which can be done at a slower gait. Under usual circumstances, a horse should be required to exert a pull of about one-tenth of his weight. When a horse is overloaded or underloaded, the efficiency is greatly reduced. Under practical conditions this is of value, for it influences

the farming operations. The horses should be loaded so that they can work steadily throughout the day without requiring long intervals for rest; and they should not be loaded lightly and driven fast, as either method lowers the efficiency of the work produced.

An item which is often overlooked in the care of draft horses, especially under farming conditions, is the care of feet. If horses are kept on the farm continually and not used for road work, it is very seldom that they will require shoes, but their feet will need attention which can be given with a rasp and pair of nippers. There is no necessity for horses' feet being grown out and broken off, when a little attention will keep them in good condition. If horses do road work, then it is necessary to have them shod, and the shoes should be put on securely and changed or reset every six weeks, or sooner, depending on the kind of work. Injury to horses' feet is often caused by leaving shoes on too long and thereby causing contraction.

STABLES

In the construction of stables for work horses, the principal requisite should be that they are handy. One of the most convenient arrangements is to have single stalls facing toward the side of the barn with the feed alleys in front of the horse. This will leave a large driveway behind the horses for them to back out, and provide hitching room. The harness stalls in this case could be on the opposite side of the alley, which may be partially devoted to box stalls, feed bins, carriage rooms, and the like.

Another essential point is comfort. For extreme comfort, the box stall is essential, but for work horses, under

average conditions, the single stall is very satisfactory. The usual dimensions are five feet wide and ten feet deep from the front of the manger back. This will give enough depth that the horses will not kick one another. The mangers should be made in a convenient manner, which

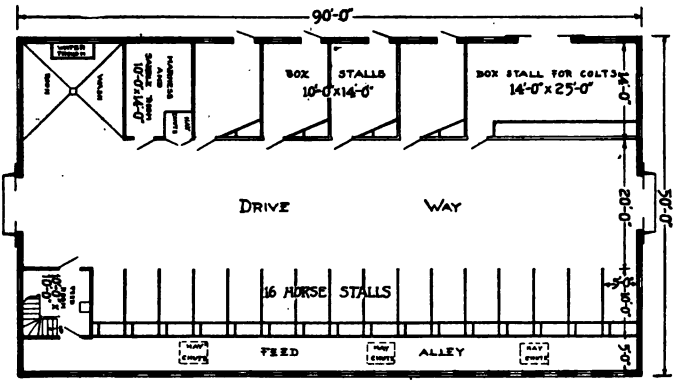


FIG. 29. — Floor Plan for a Convenient Horse Barn.

will necessitate them not being too deep, so that the hay can be easily reached and so the bottom will not fill up with hay, moldy grain, and similar material. Board floors in the stalls over the regular concrete floor are usually preferred.

Sanitary conditions as influenced by drainage, light, and ventilation are often overlooked. These points are essential in insuring health. Protection against drafts is often neglected. The horse does not require an especially warm barn under average conditions, but it does need one that is protected from drafts, as such will cause colds, especially when the horse is warm.

All horse barns should be accompanied by paddocks or

lots where the horses can be let out for exercise when not at work. A few grass lots of this kind, where the horses can be divided up, will help considerably in making the feet and legs last longer, as continued standing upon board, cement, or other floors of that nature is destructive to the best interests of the feet and legs. Pastures into which the horses may be turned during Sunday or idle days are essential, as this lowers the cost of feed, and also lessens the danger of azoturia. A little grass will also help the digestive system by keeping it in better tone, and thereby insure a longer period of usefulness for the horse. Exercise lots should be provided where horses can be turned out at any time. These should be long and narrow rather than square or circular. In some sections they will need to be graveled or floored on account of mud. Twenty-five dollars will surface a fair-sized lot. This lot will be a poor substitute for regular work, but will aid greatly in keeping in condition horses that are irregularly used.

CHAPTER XIX

THE BROOD MARE

BROOD mares have proven to be economical producers of farm work, since the value of the foals produced more than offsets the loss of labor and the increased feed as compared with mules or geldings. The brood mare is especially a dual purpose animal. She produces both work and foals. There are few people that can afford to keep a brood mare solely for the colt that she will produce.

FEEDING

Feed during the breeding season.

Feeding the brood mare is very similar to feeding the work horse, except that the brood mare, in addition to doing regular work, is getting in condition for breeding, suckling a colt, or developing the fœtus of the young. In either case the brood mare needs more protein and ash than is required for the work horse, but the supply of carbohydrates or energy-producing foods must also be large, owing to the work that she is doing. In obtaining a ration, then, that is suitable for a brood mare during the breeding season, one must give feeds that are slightly higher in protein than those needed for work horses. Such feeds as oats, balanced with oil meal or bran and good bright clover or alfalfa hay, are suitable for this purpose. The feed prior to the breeding season should keep the mare

PLATE XII. — "LIBERTY OR DEATH" IS THE IMPERATIVE DEMAND OF BOTH BROOD MARE AND FOAL.

Above, a handy lot where brood mares may be turned out with their foals; below, brood mares are successfully wintered in the open if some shelter and plenty of legume hay is provided.

in good flesh. If she is idle, she must be turned on pasture or in a lot that will give her plenty of exercise to keep her from becoming too fat, as excessively fat or excessively thin mares are not as likely to become pregnant as mares in good, hard, physical flesh. Some breeders believe that mares are hard to get in foal when on clover pasture, but as such pasture is the natural habitat of the horse, it does not seem reasonable that any such condition should exist.

Feed during pregnancy.

After the brood mare has proven to be in foal the feed must be rather liberal. She is usually suckling a foal as well as developing the fœtus and this means that she stands in need of a large amount of protein and ash as well as energy-forming feeds. This, as suggested in the previous paragraph, should be supplied by the legumes, oats, oil meal, or bran. Many mistakes are made on this score, and often the brood mares are not fed as well as the geldings. A hard-worked mare in foal and suckling a colt will need from one-and-one-fourth to one-and-one-half pounds of grain and an equal amount of hay for every 100 pounds of live weight. If the mares are not working in winter, it is not essential that they be fed grain if provided with legume or grain hay. In many sections mares are wintered very successfully if in good flesh in the fall by running on stubble fields and to the straw stacks with the addition of a feed of clover or alfalfa hay in the evening. Then in the spring they are grained for two or three weeks before active work begins.

Feed during parturition.

Previous to parturition, the mare should be kept on good laxative feed so that the bowels will be in perfectly

normal condition. A grain ration consisting of one-half oats and one-half bran by measure has proven very satisfactory. The feed at this time must not be so heavy that the bowels will be extended more than normally. If it is possible to have the mares on pasture, so much the better, as this is the natural condition for horses. After foaling, the mare will not need any feed for a few hours, and then the first feed should be a bran mash or something cooling in its general nature. This should be followed in five or six hours with a small feed of bran and oats, providing the mare is getting along nicely. Then later the feed can be gradually increased, depending on the condition of the mare and foal. If the mare seems to have an over-abundance of milk, it is sometimes necessary that she be not fed very heavily, but if her milk-flow is lacking, it will be necessary to feed more heavily to try to increase the flow. For this purpose, very good results are obtained by some green feed, such as good pasture, or grass which is cut and given the mare. As the mare gets into good physical condition, her ration may be gradually changed back to that fed when the mare was suckling a colt.

BREEDING PRACTICES

Season to breed.

Nearly all foals come in the spring of the year, although artificial conditions may sometimes make it undesirable for the foals to be born at this season. With race horses, and usually with show horses, the ages are counted from January 1st of the year of foaling, regardless of the actual age. In such cases, it is necessary to have the mares foal as soon after January 1st as possible. Under farm condi-

tions, however, it is usually advisable to breed the mare so that she will foal after the spring weather has opened up and the pastures and lots are accessible. The general exceptions to this rule are due to mares being busy, and to the inability to get them to breed at the proper time. With the work mare the time of foaling may be adjusted to the season when the least loss of work will result. It must be borne in mind that while mares are pregnant they can do more work than when suckling a colt. Especially is this true when the foal is only a few days or a week old. If the heavy work of the farm comes in the spring, therefore, the foal should not arrive until the rush is over, so that the mare can be turned out to pasture as soon as the foal is dropped. Generally speaking, fall foals are not as desirable as spring foals, but with good feed may be raised very successfully. The larger number of colts throughout the West are dropped in April, May, and June. Very few are dropped in March and July. Early foals necessitate good barns. In breeding the mares in the fall, it is often necessary to give more feed, preferably of a succulent nature, so as to start the mare picking up a little and cause her to breed when she would not otherwise do so.

Heat and gestation period.

In mares the period of heat usually occurs every eighteen to twenty-one days, and lasts from three to five days. The first period of heat after foaling occurs in nine days or less if the mare is perfectly healthy, and received no injury during parturition. The mare is usually bred at this nine-day period if she is in good condition.

The gestation period varies from 330 to 340 days, the average usually given as 336 days. Most horse-men

figure eleven months, and this is usually close enough. Mares vary greatly in the length of the period of gestation. Some perfectly healthy foals may be dropped in less than ten months and others may be carried for twelve months. Usually, however, a variation of over two weeks is considered abnormal.

Conditions affecting breeding.

Some horse-men are successful in breeding mares at two years of age, but it is not customary to breed until three. When the mare is bred at two years of age she is usually allowed to skip the next year, and is fed very liberally. Otherwise the two-year-old mare will be stunted considerably in growth. The argument in favor of the early breeding is that it insures a more reliable breeder. This, however, has never been fully demonstrated.

The breeding mare should not be overly fat. A mare will breed better if she is in normal flesh than if she is pampered. A better plan is to have the mare increasing in flesh rather than decreasing at the time of breeding, if there is to be any variation one way or the other. If the mares have any sickness due to foaling, or any trouble with the sexual organs, they should not be bred until they have thoroughly recovered from the ailment. It is better to allow them rest until fall and breed them at that time than to run any unnecessary risks. If perfectly normal, the brood mare is generally bred at the ninth day after foaling, and if not bred at this time, she occasionally will not do so until the colt is weaned, although this is not usually the case.

Serving the mare.

The first item in serving the mare is to ascertain whether or not she is in heat. This is determined by

leading the mare up to one side of a teasing pole, and then leading the stallion on the opposite side and allowing him to bite and otherwise play with her, which process is known as teasing. If the mare is in heat she will submit to the teasing, and show signs of heat, but if not, she will fight and attempt to kick the stallion. It is sometimes advisable to permit the stallion to tease her for several minutes, for some mares, particularly fillies, are shy about accepting the stallion, and will not at first exhibit signs of heat. The presence of heat is indicated by passing a white viscous fluid, and by a nervous, excitable condition. Usually if the mare is in pasture with other mares or geldings, they will be riding or teasing her. These signs, however, should not be relied on, as a mare may pass through several periods of heat without making any apparent signs, even though she is worked every day and the driver is watching to tell when she comes in. The only safe way is to try her with the stallion. As the mare stays in heat from three to five days, it is not necessary to try her less than every five days. The larger part of stallion men practice trying once a week, which is fairly satisfactory if not neglected.

To insure that the mare will get in foal, and that there is no disease, she should be properly examined. A blood-shot condition of the eyelids or vulva often indicates some ailment, and an excited condition. Very often, also, the neck of the uterus or the os is closed, and if so, the mare will not become pregnant, as the spermatozoa cannot enter the uterus. If such is the case, the mare should be opened by inserting a finger into the mouth of the os, and gently dilating the same.

Barrenness is also met with. Mares may be barren because of imperfectly formed sexual organs, diseased

condition of the sexual organs, or by having the neck of the uterus stopped up with mucus, or excessively enlarged. The latter ailments are very common, and if the neck of the uterus is closed, it should be opened as above indicated. In inserting the hand, it should always be perfectly clean and lubricated with pure soapsuds. When any diseased condition is suspected, the hands should be absolutely free from any breaks in the skin, such as cuts, scratches, hang nails, and the like. Mares that are in diseased condition should not be bred by a stallion. If it is thought best to breed them, this should be done artificially. A veterinarian should be called to handle any unusual conditions of the sexual organs, as they require skilled treatment.

The re-trying system that is practiced in the serving of the mares is to re-try them in three weeks after breeding, and then re-try again once a week for four weeks following, or until seven weeks from the time of breeding. Many mares will not re-breed at twenty-one days if they are not in foal, but come in at the fourth or fifth week after breeding. In order, therefore, to be sure that they are in foal, it is necessary to have them re-tried at least four times, instead of once, as many stallion men practice.

Artificial impregnation.

Three methods of artificial impregnation are commonly practiced: with the breeding bag, with the impregnating syringe, and with the use of capsules. The object of artificial impregnation is to breed two or more mares from one service of the horse, and in this manner lessen the necessary services of the horse, and increase the number of mares which it is possible for him to breed. When a mare is bred, the horse injects the semen or male fluid

containing the spermatozoa into the vagina of the mare, from whence the spermatozoa pass into the uterus and from there into the Fallopian tube where they meet the ovum or female cells and impregnation proper takes place. This may not occur for several hours after copulation. The mare produces one, and sometimes more than one ovum during the period of heat, while the semen ejected by the horse contains hundreds of the microscopic sperm-cells, and only one of which may unite with the ovum to produce the colt. Thus the horse at each act of copulation produces many more spermatozoa than are actually needed, provided of course that he is a normal, healthy horse. The idea in artificial impregnation is to collect some of these spermatozoa which are not needed by the mare bred, and transfer them to other mares. If properly conducted this will produce exactly the same impregnation as if the mares were bred directly by the stallion.

The breeding bag is a rubber bag which is tied on to the end of the penis. When the penis is withdrawn after service, the bag with the ejected semen comes back with it. The bag is then placed in warm water, 95° to 101° temperature. A syringe is filled with the fluid, and emptied into the vagina of the mare. As only a part of the fluid is used for one impregnation, a number of mares may be bred from this one bag of semen. The objections to this method are: stallions may refuse to serve with the breeding bag attached; the fluid may become contaminated with germs; the fluid may be exposed to the light and the sperm-cells killed; and lastly, the stallion, even though it may not refuse at first, usually does refuse to serve properly after the breeding bag has been used for some time.

With the impregnating syringe, the operator allows the stallion to serve in the normal manner, then uses a syringe to go into the vagina, or if the semen has been injected into the uterus proper, to go into the uterus and collect the semen by means of the syringe. The type of syringe shown in Fig. 30 is now being very successfully used in obtaining the semen either from the uterus or from the vagina. After withdrawing the semen, the operator may proceed directly to the other mares, insert the end of the syringe into the uterus of the mare, and deposit some of the fluid, or he may fill capsules from the fluid and insert capsules into the other mares. In these cases it is necessary to have a vessel of water from 95° to 101° temperature, so that the syringe and semen may be held at a constant temperature, and also that the instruments and materials be kept out of the direct sunlight. Sanitary precautions are also absolutely necessary, as the spermatozoa are very delicate, and have to be handled with every degree of care.

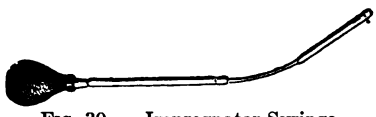


FIG. 30. — Impregnator Syringe.

With the capsule system of breeding, the stallion is allowed to serve one mare in the usual manner; the operator then takes a gelatine capsule in the hollow of his hand, inserts his hand into the vagina and scoops the capsule full of semen. He then withdraws his arm carefully, holding the capsule in the hollow of his hand to protect from light, and holding his finger over the opening to prevent the loss of fluid. He immediately goes to another mare and inserts his hand and the capsule into the vagina, and pushes the capsule carefully on into the uterus. This operation is very successful if the

mare which the stallion breeds does not take the semen completely into the uterus. If the semen, however, does all go into the uterus, it cannot be obtained by this method. Therefore, it is not largely used, as it cannot always be depended on, but it is a very easy and useful method in some cases.

With all of these methods of artificial impregnation, it is advisable to have the mares in heat, although some results have been obtained otherwise. All the mares should be at the breeding place at the same time. The semen may be kept for a limited interval if under ideal conditions, but this is not advisable, as the spermatozoa weaken rapidly even when kept in the best manner possible. It is also necessary that everything be kept in sanitary condition, and that the operator be exceedingly careful in regard to temperature and light. Artificial impregnation as a whole has proved very successful and will doubtless be used more in the future.

Care after service.

After the mare has been bred she should be kept rather quiet for several hours, but after that she may be put to work as usual. The best treatment she can receive is steady work and three meals a day. If there is no slipping, straining, or jerking, and the mare keeps up in condition on good feed, the work is probably not too hard, providing it be steady. The mare should not be worked so hard that she will run down in condition on good feed. If there is any slacking in the work it should be about the fifth or sixth month, as it is at that time that the fœtus is making its most rapid growth. During the last months of pregnancy the mare can do a large amount of work without injury. If the mare is working steadily it will not hurt

her to work up until the time she drops her foal. Under these circumstances, she will usually be in good, strong, healthy condition and her digestive system will be in order. If she is laid off in new surroundings and the feeding greatly changed, her system is liable to be upset and leave her in worse condition than the regular work. Parturition is a severe strain, and in order to bring forth a vigorous, strong foal, the mare must be in good condition.

Some mares come in heat after missing three or four regular periods. Such cases are often due to abortion. Mares of this kind should be carefully watched, and examined to see that their sexual organs are in good condition. A few mares will come in heat regularly and accept the horse, and still be in foal from the first service. Irregular conditions of this kind require that the mare owners be exceedingly careful, watch the mares closely, and use their best judgment in regard to them.

Signs of pregnancy.

The first sign of pregnancy, and the one which is used in breeding mares, is the absence of the usual heat period. When a mare becomes pregnant, the usual periods of heat do not appear, and the mouth of the womb becomes closed. As the pregnancy advances, the mare usually becomes quieter, has a tendency to take on fat, is cross toward other horses, has somewhat fuller flanks, and there is a general contraction of the vulva. In the more advanced stages the belly becomes more pendulous, the udder develops, and a jerking movement of the fœtus is often noticed, especially after the mare has taken a drink of cold water. If there is any special doubt in regard to the pregnancy of the mare, and it becomes necessary to ascertain whether she is pregnant or not,

a competent veterinarian should make a rectal examination, as the fœtus can be felt in this manner. This examination should not be undertaken by one who is not skilled in such work, as it is likely to cause abortion if not carefully performed.

Signs of parturition.

Since the gestation period is of uncertain length with mares, they should be closely watched from the tenth month until parturition. There are some signs of the near approach of parturition that seldom fail. The udder becomes greatly distended some time before foaling, but the teats very seldom fill out full and plump to the end more than a few days before the foal is born. In most mares the vulva enlarges, and a reddening of the lining of the vagina is noticed immediately prior to parturition. There is also a marked falling away and depression of the rump muscles about a week before the time. About twenty-four hours before foaling a clear wax forms on the end of the nipple. This wax is often confused with that formed from the colostrum which escapes from the udder, so care is needed in distinguishing it. Immediately prior to time of parturition, the mare will usually show some nervousness and if with other stock, a desire to be left alone.

Parturition.

The normal presentation of the fœtus at the time of parturition is fore-feet first, with the head between the front legs, and these act as a sort of wedge in dilating the passage. Sometimes the foal is born with a rear presentation, in which case the rear feet come out first, and the widening of the legs acts in a similar manner. One of the variations from these presentations is with the front

feet back. In this case, unless the mare is unusually open, it will be necessary to push the fœtus back and get it straightened out so that it will come in normal manner. Occasionally a rear presentation will come with the rump first rather than the feet. It is practically impossible to deliver the colt in this manner, and again it must be pushed back and worked around so that it will be in normal manner, either front or rear. Often the colt will come with one leg or the other back in either the fore or rear presentation. It is sometimes possible to deliver this presentation, but usually it is advisable to try to straighten out the limb that is crooked. If the mare needs assistance in delivering the fœtus because of the abnormal size or presentation, the help should be rendered as soon as possible. The mare should be allowed to labor only a short time before an investigation is made, as the chances for successful delivery are increased if the mare is assisted at once before the parts become dry, and before her normal pains of delivery weaken. In pulling the fœtus from the mare, it should be put in proper position and then gently pulled in a downward direction. The pulling should be gentle and steady, allowing the mare to aid in every way possible. Otherwise injury is likely to occur by bruising, tearing, or cutting some of the tissues. If the case cannot be delivered in the usual manner, it may be necessary to dissect the fœtus in order to save the life of the mare. In all cases of this kind, great care should be taken to lessen the inflammation, as there is likely to be infection, resulting in blood poisoning.

Care after parturition.

The place where the mare foals is very important, because of the danger of the disease known as "navel

disease" or "joint disease," which kills hundreds of colts every year. When the colts are a few days old the joints swell, the legs become stiff, and the animal usually dies. A veterinarian may be called at this time, but there is very little hope of the animal recovering. Fortunately, however, the disease may be prevented. It is a germ disease caused by putrefactive organisms, the germs that cause decay and rotting around the barns, strawstacks, and manure piles. They enter through the raw navel cord and if the colt is born and kept for the first few days in a place where these germs are not present, the disease will not exist. The best place, therefore, is in some grass lot or pasture where there are no sheds, barns, manure piles, or old straw stacks. The next best place is in a box stall that has been thoroughly disinfected and cleaned. The whole stall must be cleaned perfectly, new bedding put in, and thoroughly sprayed with some good disinfectant. If possible, two stalls should be prepared, and when the foal arrives, the mare's udder and hind parts should be washed with some non-poisonous disinfectant, such as sheep dip, and the mare and foal transferred to the other stall. The first stall can then be cleaned out and prepared for the next mare. If the extra stall is not at hand, wash the mare's udder as indicated, clean out all the blood and after-birth, and disinfect again.

The colt's belly and cord should be cleaned immediately with some good disinfectant. A good way of doing this is to cut the umbilical cord about an inch and a half long, and completely immerse the same in an iodine solution, also washing the immediately surrounding parts of the belly with the solution. It is important that this gets on the inner parts, as well as on the external surface of the cord. The cord should later be treated with some

drying powder. A suitable powder is made of two parts each of tannic acid, boracic acid, and zinc oxide, with one part of iodoform. Formerly it was thought well to tie the cord, but it has been found that this has a tendency to keep a jelly-like substance within the cord, forming a good medium for the action of bacteria. The proper treatment is to use some material that will tend to dry up the cord as quickly as possible, and at the same time keep out bacteria. The whole process is to prevent putrefactive germs from entering the raw navel, although it may happen that the germs entering through the mouth may cause the same effect. Scours is another disease that often comes from getting disease germs into the system.

Another trouble that often affects foals during the first twenty-four to forty-eight hours is constipation. If the colt does not receive the first milk, known as colostrum, which is nature's laxative provided to start the passage of the bowels, he may have serious difficulty. Many breeders do not notice that there is anything wrong with the colt until he begins to weaken and fails to take nourishment. When the trouble has progressed thus far it is often hard to treat successfully. The simplest treatment, if the colt fails to make the proper passage of the first excreta, which is dark brown in color, is a solution of soapsuds injected into the rectum. This treatment should not be given unless necessary, which will seldom be the case when the mare's milk is normal and the colt healthy.

The mare should now be allowed to rest. The working of the mare after foaling should be delayed as long as possible, preferably until after weaning. If kept up, the mare should have plenty of nourishing, rather laxative food, except for the first day or two, when she must be

fed lightly. Medicines and physics should be avoided, and if any serious condition arises a veterinarian called. The best place, however, for both mare and foal is out in a good, rich pasture, unless the weather is extremely bad, and even then they should be kept in just as little as possible. Scours and other digestive troubles are the chief dangers at this time and they are seldom contracted in the pasture.

If it is necessary to work the mare, she should at least be given a rest of ten days to two weeks. When first started to work the mare should be brought in so as to allow the colt to suck during the middle of the forenoon and afternoon. After the colt becomes accustomed to doing without the mare and her milk, the period may be lengthened to the half day periods if the days are not too long. If the mare is warm or is a heavy milker, some of the fluid should be milked out, or scours and indigestion will be produced in the colt. The colt should never be allowed milk from hot mares. The mares should be allowed to cool to some extent and part of the milk drawn before turning with the colt.

The weaning should be put off as long as possible. This usually means until late in the fall. Whether or not the mares work, the colts should be taught to eat early and by the time they are six months old they will hardly miss the mother. Feed put into a colt at this age starts the framework of the future horse. A saving of feed at this time will mean a sacrifice in the value of the horse in the future.

STABLES, SHEDS, AND LOTS

Colts whose mothers must work need other exercise than that obtainable in the box stall. Two general plans may be adopted. One is a strong, high paddock

where all the foals are turned out when the mares are at work, and the other is to turn the mare and the foal in the pasture at night. Usually the latter method is the easiest to put into practice. In either case, the colt must be taught to eat grain if possible. This may be brought about by putting an extra trough in the stall, or by a creep in the paddock where they can run and not be bothered by the other horses. Some arrangement of this kind is necessary. Open sheds for wintering brood mares are practical, especially when there is not sufficient exercise in the form of work to keep these mares in good physical condition. A mistake that is often made is confining the mares closely, feeding them heavily, and thereby getting them softer and fatter than they should be. One way to avoid this is by the open shed system, having a shed where the mares can run in and find protection, or run out into an open lot for exercise. Sheds of this kind will keep the mares in good physical condition.

A horse barn is not complete unless it has maternity stalls. By these are meant large, roomy box stalls, where the mare may foal without being in cramped quarters, if it is necessary that she foal in the barn. The stalls are also useful for the mare and colt, as the common small box stall is somewhat confining for the mare and foal. Double stalls with a pole run between the horses, which can be converted into large, roomy box stalls opening on the outside are a very practical method of solving the problem. During the winter the stalls will hold more animals than if arranged in permanent box stalls.

CHAPTER XX

THE GROWING STOCK

THE future size and value of the colt depend to a large extent on the start it gets. Gains may be economically made on weanlings and yearlings, but an unusually large amount of feed is necessary to make much growth if the animal is stunted in its early life. On account of this fact the horse-men who are making the biggest success in the raising of horses are careful of them the first and second winters and let the colts rough it later in life rather than when they are young.

FUNDAMENTALS OF FEEDING

The principles involved in feeding growing horses are practically the same as with other kinds of live-stock. The chief requirements of the body at this time are for protein and for mineral matter or ash. It is, therefore, especially important that these nutrients be supplied in the proper quantities. On an average, the proper nutritive ratio for growing horses will be about one to five or one to six; that is, the ration will need to contain five or six parts carbohydrates or their equivalent to one part of protein. Of the feeds best adapted to produce such a ratio may be mentioned the leguminous hays, such as alfalfa, clover, vetch, and among the grains oats and bran will be the best. The native pasture grasses, when

thrifty, will usually supply about the proper nutritive ration for growing horses. Among the feeds which are deficient in protein and mineral matter, and therefore unsatisfactory for growing horses, may be mentioned timothy hay, cheat hay, corn, and barley. When any of these feeds are used for young horses, a limited amount of other feeds containing large quantities of protein and mineral matter should be supplied.

RAISING THE ORPHAN

The feeding of an orphan foal, or a foal that is insufficiently nursed by its dam, is a task which requires much care and patience. Cow's milk is the best substitute for that of the mare, although the latter has more sugar and less fat than the former. If the cow's milk is given to a foal it should be modified, depending on the richness of the milk. Milk low in butter-fat is best for this purpose. One pint of cow's milk diluted with one-fourth pint of lime-water, and to which a teaspoonful of sugar is added, approximately approaches the consistency of mare's milk. Lime-water helps to prevent the milk from forming into hard curds. A nursing bottle with a rubber nipple is about the best means of giving the milk, but some prefer to use the spout of a teapot, with the finger of a kid glove on the end of the spout, with a hole punched in the same so that the milk can flow through it. The instruments should be thoroughly cleaned and sterilized with boiling water each time before they are used, and the milk should be warmed to a temperature of about 100° F. before feeding. At first the colt should be fed every hour, giving it about one-half pint at each feeding. It is advisable at the start to feed the colt two or three times at

night, but after a short time, he will be able to consume enough milk to carry him through the night. As the colt grows older, the quantity of milk should be gradually increased and the number of feeds decreased, until he is about a month old, when, if he is doing nicely, he may be fed only four or five times a day, and the sugar and lime-water omitted. He should also be taught to drink out of a pail by this time, and the feed gradually increased, although great care must be taken that too much milk is not given, as the result will be scours. Many orphan foals are fed more milk than they need rather than not enough. The orphan foal should be taught to eat grain as early as possible. If a little is added to the bucket with the milk, the colt will soon be munching at it when the milk is gone, and in this way will soon be eating grain. Unless the foal is early started on grain, he will generally become pot-bellied, and after such an appearance is acquired, it takes considerable time, good feed and care to overcome it.

FEEDING THE YOUNG FOALS

The larger number of horse-men do not take enough pains in starting the colt on grain. This is especially important if the mare is at work. Colts should not be allowed to run with mares when in the field, but if necessary the mare should be brought in to allow the colt to suck. After a period of two weeks of this practice, it should not be necessary, as the colt can go from one period to the regular feeding period. If a box is arranged near his mother, and a mixture of rolled oats and bran placed in it, he will soon acquire the habit of nibbling at it while she is eating. If such a box is kept with some

grain in it while the dam is gone, the colt will soon be eating considerable grain. This will greatly increase the colt's growth, as it is a correct supplement for the mare's milk. The colt will not eat too much if allowed all he wants and if he consumes only one pound of grain a day the same will be a valuable addition to his ration.

If the mares and colts are on pasture, a creep should be arranged for the colts. This can be put near the salting trough for the mares and in this way the mares will visit it every day and the colts can get under the creep to their grain. This will keep the colts growing through the drier period, when otherwise they would not make any appreciable growth. One should not be in a hurry to wean the colt, as the additional milk which the mare gives, even if small, is of benefit to the colt. However, if the mare's milk does not agree with the colt, and he does not seem to thrive on it, it is often well to wean him earlier, and put on a grain ration as heavy as he will stand. Normally it is not advisable to wean the colt until five or six months of age.

HALTER-BREAKING

Halter-breaking should be brought about just as soon as possible. A few minutes' work while the colt is still running with the mare will suffice better than the same number of hours when the colt is two or three years of age. The chief advantage of halter-breaking early in life is not so much that it is accomplished with less effort, but that the colt may be handled in any way desired. If such is the case, he will receive better treatment and better care. If halter-broken, his feet may be properly cared for and crooked legs and deformed feet prevented. Usually no trouble will be experienced in getting the colt

PLATE XIII. — "AS THE TWIG IS BENT."

Above left, trimming the colt's feet on a rainy day; above right, an open shed that colts like; center, breaking the colt to lead; below, a good method of tying halter pullers.

to lead, but if somewhat stubborn, a rope may be passed back through the halter ring, and a loop dropped over the rump and placed so that it will strike the colt in the thighs. If this is pulled upon rather than the halter, the colt will usually walk up without any great trouble. If the colt is tied up, a rope should be passed through its halter, and around the belly, and tied in that manner. Then when he pulls upon it, it will tighten around his belly, and pull there instead of on his head. Very often if this is not done, the head will become bruised when the colt struggles.

TRIMMING THE HOOFS

Trimming the colt's hoofs is a task which is often neglected. The horn grows out and part of it breaks off, so that the foot sets on the ground unevenly and as the bones are soft and cartilaginous at this time, a crooked leg or deformed foot results. This may be avoided by trimming the hoof occasionally, so that it will set level. To do this, take up the foot, and trim off the surplus horn with a pair of hoof nippers, a heavy knife, or rasp. Round off the edges so that there is less tendency for the hoof to break. Handle the colt gently at first, and if he struggles to get his foot down, talk gently to him and pet him, but do not release the foot. If he gets his foot away a few times he will

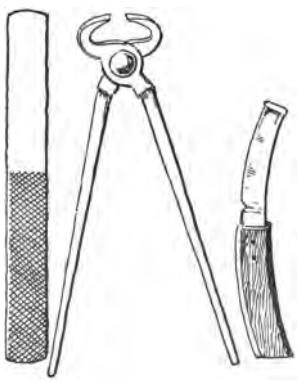


FIG. 31. — Tools for Trimming Horse's Feet.

acquire the habit and will always make trouble in handling the feet, either for shoeing or for trimming. A common method is to stand the colt on the board floor and trim off the surplus horn with his foot on the floor. One front foot is tied up to make him keep his other foot on the floor. In working with the left hind foot, tie up the left fore foot; and with the right hind foot, the right fore foot. With this method, the horn is cut with a mallet and chisel. This is a quick and easy device adapted to vicious horses, but the operator cannot do as good a piece of work, and often has difficulty in telling exactly where to cut, since he has to guess at the position of the sole. In buying nippers or any instrument for hoof cutting, one should procure only the best, for the poorer ones will probably not cut at all. (See Fig. 31.)

WINTERING THE FOAL

Many persons in raising their young horses make a mistake in not supplying them with a liberal enough ration, especially during the first year. After the colts are weaned from the dam, it is difficult to keep them in good condition, and at such times special care and feed should be given them. Feed is seldom made too liberal, as this is the time to shove the colt if exceptional growth is desired. Horsemen agree that if you stunt the colt you stunt the horse, and that if you have a stunted yearling you seldom obtain a good mature horse. On the other hand, a growthy yearling does not need the feed nor care afterwards that the stunted one demands. In order to get this growth in the winter, it is necessary that the colt be fed some grain in connection with hay and roughage. If timothy is fed as the roughage, the grain must be of nitrogenous char-

acter, as oats and bran. If good alfalfa or clover hay is accessible for the colt, this with oats will make a very desirable ration. Young colts make larger growth than older horses in proportion to the feed consumed and hence it is an economical proposition to put grain into the young animal.

In addition to good feed, the young colt must have plenty of exercise. An open shed arrangement is excellent in most sections of the country for this purpose. This shed may be constructed by putting the feeding quarters inside and having them bedded so that the colt may have a dry place to eat and sleep, but with access to a lot or pasture where they may run at will. Colts handled in this way will have long hair, but will develop a ruggedness that cannot be obtained with colts that are raised with lack of exercise. Winter pasture should be used if available but it should not be depended on for the entire ration if maximum growth is desired.

CASTRATION

Castration is usually performed when the colt is one year old. If the animal is undeveloped in the neck and fore-quarters, the castration is sometimes deferred until the second year, but there is less danger of losing a colt by castration when one year old than later. Unless colts are castrated they usually have to be separated from other horses as early as the second winter, as they become a great nuisance, although they are not usually capable of getting colts until the second spring.

FEEDING THE YEARLING

The feed that the yearling should obtain will depend largely on his future use. If maximum gain is to be

desired, as in the case of pure-bred colts, they should receive some grain in connection with pasture. If the animal is merely growing for market purposes and the pasture is good, this should be sufficient. Under range conditions, nothing other than grass will be supplied. In sections in which the grass is limited and more grain is raised, the grain can be supplied to better advantage. If the maximum gains are desired, the colt should be kept up in the day-time when the flies become bad, and fed some grain, and then turned out at night.

WINTERING THE YEARLING

Plenty of bright legume hay, good water, shed for shelter, and as much oats as can be spared is a program that makes for ideal winter management of the yearling. If the animals come into the winter in good condition, very little grain is usually needed. A feed of grain once a day will help materially in keeping the flesh on the colt, and therefore make for larger gains. Under range conditions, the yearlings are usually left to run with the bunch, but if maximum size is desired, it would be more satisfactory to cut them from the bunch and winter on the better pasture, or with hay. With prue-bred stock, when large size is desired, it is essential that some grain be fed in connection with the hay. Oats are very satisfactory for this, but if the hay is a legume, rolled barley will prove quite satisfactory. The shed arrangement spoken of for wintering the foal is even more essential for wintering older animals. It is not so necessary that the older colts have as good shelter as the younger ones. In the sections where the winters are warm and wet, protection should be provided so that they can keep out of the rainy

weather. In sections where snows and storms are bad, protection is needed for like reason. Under moderate conditions of winter, the horses will do very well if left outside most of the time, with protection provided for extreme cases. Colts wintered in this manner will not have the same sleekness as the barn-fed colt but they will obtain a ruggedness of constitution that will last much longer than a glossy coat.

GROWING THE TWOS AND THREES

The essentials in growing the twos and threes are to provide feeds that will continue the growth which was started in the foal and yearling. Fine pasture in summer, with good hay in winter, together with protection from storms makes for this growth. Colts that are twos and threes will not need as much grain as the foal or yearling but will consume rougher feeds. These feeds, however, should be of nutritious character, as legume or cereal hay. Mature work horses do very well on straw and feeds of less nutritious character, but they are not suitable for wintering the immature stock. If the twos or threes are being developed for show purposes, they will need to be pushed along with some grain in order to give them their maximum size and the most satisfactory gains. For commercial purposes, however, very little grain is needed, until they reach the age when they will start to work.

GENTLING

There can be no hard and fast rule for the breaking or gentling of colts. The complete plans and systems of horse-breaking are useful only as suggestions which may be applied as occasion arises. No two colts are exactly

alike. What applies to one will not of necessity apply to another. However, since the western range produces a class of horses that are of exceptional individual merit through the use of good sires, it is well to give a system of management which many western horsemen have tried and recommended as the best. The range horses are not handled until from three to five years of age, and their only acquaintanceship with man being at the time they were branded and castrated, they are naturally wild. The horses are quietly rounded up and driven to the corral. One of the horses to be handled is then worked out of the bunch into the catching pen, which is a round corral built of poles. It is usually fifty or sixty feet in diameter, and the sides should be at least ten or twelve feet high. When the horse has been driven into the corral, the two men who are to conduct the work of gentling enter as quietly as possible. The lariat rope is hung on a short, strong wire on the side of the corral, and the man handling it steps back to the center of the ring, pulling the rope tight enough to hold the noose about three feet from the ground. The assistant then drives the horses around the corral. Instinctively the horse keeps to the outside whether trotting or loping, and goes into the running noose with his forelegs, striking the top of the noose with his breast. The man handling the rope quickly draws it tight, thereby drawing the horse's front legs together and dropping him in a heap on the soft dirt of the corral.

As soon as the horse is down, the assistant kneels on his head, thereby holding him down. He may also blindfold the horse by dropping a piece of blanket over his head. The hobbles are placed upon him and he is allowed to get up. These hobbles have a padded strap

buckled around each of the four pasterns. Each strap is connected to a center ring by a piece of chain eighteen inches long, thus fastening all four feet together close enough to prevent the horse from running, striking, or kicking, but not close enough to prevent him from standing comfortably. The men now approach the horse squarely from the side, just opposite the withers, and proceed to handle him over all parts, talking quietly to him meanwhile. This is continued for twelve or fifteen minutes, and the horse allowed to smell harness, saddles, whips, blankets, and the like. He may then be harnessed and bridled, and left alone for a few minutes, the men leaving the corral. When they return, the horse is treated as before, and after being handled for a short time is unharnessed, petted, and the hobbles quietly removed. The horse should be quiet by this time, and may be approached and handled without the hobbles. When the lesson is over, the horse is allowed to pass quietly out of the corral and into a lot and turned back with the horses that have not been handled. Another horse is then driven into the catching corral, and the work is continued. Experienced men will handle a horse in about forty-five minutes, or from ten to twelve a day. Horses that have been handled should be kept together, and when turned out to pasture at night, they are turned with well-broken horses. The second day the horses are handled again as previously, and after this, the draft colts are usually quiet, and can be rubbed and harnessed without again resorting to the hobbles. The colts with hotter blood will usually need more treatment. After such colts are thoroughly gentled, they are then in position to be treated and broken in the same manner as farm-raised horses.

The entire work of gentling must be conducted with but one aim, to win the confidence of the horse, for no wild horse will be gentle until he is confident that the men will treat him kindly. Horses act largely from force of habit. After doing a thing a few times, they keep on whether there is a reason for it or not. A horse has a good memory, but very little real intelligence. He has much mettle and energy, with a high-strung nervous system, but very little reasoning power. All of these characteristics must be borne in mind when gentling a horse. Great care must be taken to see that all ropes, halters, harness, and the like are strong, so there is absolutely no danger of breaking.

BREAKING TO TIE

Before tying the colt, one should see that the halter is especially strong. No ordinary halter is strong enough to hold a healthy colt of two years. A very heavy halter made for the purpose should be procured. It is usually better to take a three-quarters-inch rope, pass it through the ring of the halter, and tie it around the neck with a bowline knot. Even if the halter is strong enough to hold the colt, it is not safe to tie and leave him, for he may pull hard enough to kink his neck or bruise his head. There are various ways of tying colts and halter-pullers. One of the most satisfactory methods is to take a three-fourths-inch rope, run it through the halter, and tie it with a running knot around the body. Therefore, when the colt pulls back, instead of pulling against the halter, the rope tightens and squeezes him around the abdomen and the result is that he will come up to the snubbing pole or manger. (See Plate XIII.) It is very often practical to force the colt to pull back once or twice against this and

try it out, so that he will find that he is securely tied, that pulling inflicts pain, and afterwards he is not so likely to try it even when tied only with the regular halter. Another method of tying horses is to put a loop in the rope, tying a bowline knot, and put it in place the same as a crupper on the harness, running the rope forward and passing it through the halter as before. The trouble with this tie is that the horse is likely to rupture the muscles and tendons at the seat of the tail, and it is somewhat risky on that account. Another method that is sometimes used is to tie the colt by one of the front feet. This method is open to several objections, and it is not as widely used as the other. A method that is not widely advertised, but is rather efficient, is to tie the colt with a regular halter, but fasten to a ring above his head instead of the manger, so that when he pulls back, the pulling lifts him off his feet and leaves him helpless. There is very little danger of hurting a horse by this method. Practically all colts will pull back more or less when they are first being broken, but if they are always tied so that they cannot get loose, there is no danger of their becoming pullers. These precautions need not be kept up very long if the colt never gets away. The habit of standing tied soon becomes fixed, and a string will hold them, but if they break loose once or twice, it may be several months before it is safe to tie in the ordinary manner. It is often a good plan to keep a colt loose in a box stall until he becomes used to being confined.

BREAKING TO LEAD

After the horse is somewhat gentle, it is necessary to teach him to lead. For this purpose the halter rope should have some length, and in addition to the halter it

is well to put on a hitch known as a guy rope. (See Plate XIV.) This is made by using a soft three-eighths-inch rope about twenty feet long, with a running loop like a lariat. The loop is placed around the horse's neck and then a half hitch put around the jaw. This makes a very severe hitch and should not be used for long pulls or for leading the horse, but in short quick jerks to stop him when he tries to get away. With this equipment upon the colt, a strong man should be able to handle him successfully, but at first, the training should be inside the corral so that there will be no chance for him to break loose. At the start a helper should follow behind with a whip, and urge the colt along as gently as possible without using the whip until necessary. After the colt learns what is wanted of him, he can be taught to lead up by the leader without any one behind. This may be accomplished by the leader using the whip in the left hand, and tapping the colt gently, so as to show him what is desired. The guy rope should not be used to pull upon but merely to restrain the colt if he becomes over-fractious, as he cannot be held at such times by a common halter. The colts that are to be exhibited in the show or sale ring are taught to lead up beside the attendant; while some work horses are broken in this manner, others prefer them to lead behind. Whichever is the case, they should be taught to lead up briskly without dragging back.

BREAKING TO WORK

The colt should be handled considerably before trying to work him. He should become used to being harnessed and saddled. When hitching him up, one must be sure that the harness is strong enough so that he cannot possibly

break it. One should not be lulled into a feeling of security if he goes all right the first time. With care and judgment, almost any colt can be driven without trouble the first time, but often about the third or fourth driving there may be difficulty. A colt with spirit will not give up without a struggle. One of the best practices is to hitch him with an older horse. A stay chain is attached so that the older horse may pull the wagon, and then by tying the colt to the older horse, he cannot become unmanageable. A horse that is used to breaking colts seems to enter into the spirit of it, and is a great help in this work. In some sections where four-horse teams are used, the colt is often hitched in as a wheeler, with three old horses, and in this method he must come along and do what is desired. If the colt is on good ground and the rigging is strong, one can force him to do what is wanted, with little difficulty. If the harness breaks or if one is in some dangerous place where they must get out the easiest way possible, and thus give in to him a little, it is more serious and a spoiled colt likely to be the result. Some horse-men knowing the necessity of the struggle at some time, think it would better be met the very first time, but this is a doubtful policy. The green colt is easily frightened, and what is intended to restrain him or to punish his obstinacy may scare him, so that he has little idea of what is wanted. He thus not only becomes harder to handle, but fails to learn the desired lesson. On the other hand, if he is treated more gently, he may become thoroughly accustomed to the bit and harness before making trouble. He may also learn to guide by the reins and know the meaning of the word "whoa." When this is the case, he may be mastered with little difficulty if the outfit is strong and efficient.

BREAKING SINGLE DRIVERS

High-class single drivers are broken to a strong cart and never worked double at all. This requires plenty of time and special management and equipment, since it is difficult to manage a colt hitched to a single cart. In this method of breaking colts, special carts are used. These carts are very strong and have extra long shafts so that the colts will not do any damage by kicking. An extra length must be attached to the traces, so that they will reach to the singletree. Extra heavy harness is also used; since there are very few single harnesses made strong enough for this purpose, they are usually made to order. A kicking strap is also necessary. This is a heavy strap running across the hips and buckled to the shafts on each side, and will prevent the colt from kicking out of the shafts. A crude cart may be made by using an old buggy axle and wheels, with long poles for shafts, and the harness may be worked over from a heavy double harness. Few breeders, except those dealing extensively in fine drivers, have need for these special breaking carts. Before hitching the colt to the cart, he should be thoroughly bitted by putting on a bitting harness which consists of a bridle, surcingle, and reins. The reins should be made loose at first, but gradually tightened so that the colt knows what the bit is and becomes accustomed to it so that he will not bite it. The colt should then be accustomed to the single harness and driven to some extent with it before being put to the wagon. He should be taught the terms "whoa," "get-up," and be made to know that the driver is master of the operation. After the colt's confidence is obtained is the time to put him to the strong cart and start the regular work. Even then

some difficulty may be experienced, and the driver should be ready for any trouble that may come up. Good single drivers are only obtained after a thorough education. This education requires the training to all kinds of sights, and the development of a good mouth so that he will carry the lines and travel in a free manner.

BREAKING SADDLERS

Some persons prefer to break a horse to ride even though he may never be intended for a saddle horse. The object of this is to gain complete mastery over the animal with less trouble and risk than with other methods. No outfit is needed other than a saddle, bridle, and spurs, which are obtainable on any farm. After the horse is thoroughly gentled and broken to lead, he should be accustomed to the bridle and saddle in the same way as when broken for single driver. The saddle should be put on and taken off several times, cinched up and uncinched. Working with the horse for twenty or thirty minutes in this way will accomplish much. One should then put his weight in the stirrups for a few times, getting on and off, repeating this several times. The horse should stand for a time while the rider is mounted. It should be remembered at all times that while one is trying to break the horse without bucking, he may buck, and then it is the rider's business to stay in the saddle; he must, therefore be prepared. The horse may be allowed to move about the corral a little, then led away from the barn, always turning him toward home before getting on. He will walk back to the barn in much the same way as if he were an old plow horse. The rider should then turn him the other way. This time it is better to have him out in the field,

out of sight of the barns and other horses. In fact, he should be out of sight and hearing of other horses all the time while breaking. There will now be very little difficulty, and one will find that he can ride the horse around almost any way desired. He should be ridden only a short distance the first time, and one should not be fooled because he rides like an old horse. It is likely that there will be a struggle before many times, but the colt will be used to the rider then and can be handled all right, although one may have to spur him rather hard and he may jump around and try to buck a little. There are many men in the West who would call this a cowardly way of breaking horses, but we are discussing matters from the standpoint of the good of the horse. The professional wild horsemen use the method outlined when they want a reliable saddle horse. They call it "breaking them gentle." The practice of roping a horse, saddling him up, and riding him off is not breaking; it is simply riding without breaking. A horse so handled rarely becomes tame enough so that he can be ridden by an ordinary man. After the colt is accustomed to general handling and to riding, is the time to start in with the training. If he is to be used as a cattle horse, the proper procedure is to start him to work with the cattle. If he is to be trained at special gaits, he should be first taught to walk and walk fast; then he should be taught to trot and later taught the canter, which is a restrained gallop.

SPECIAL DEVICES FOR BREAKING

Famous horse trainers who have made a reputation for handling the most vicious horses use some special methods for gaining mastery of the horse. These are

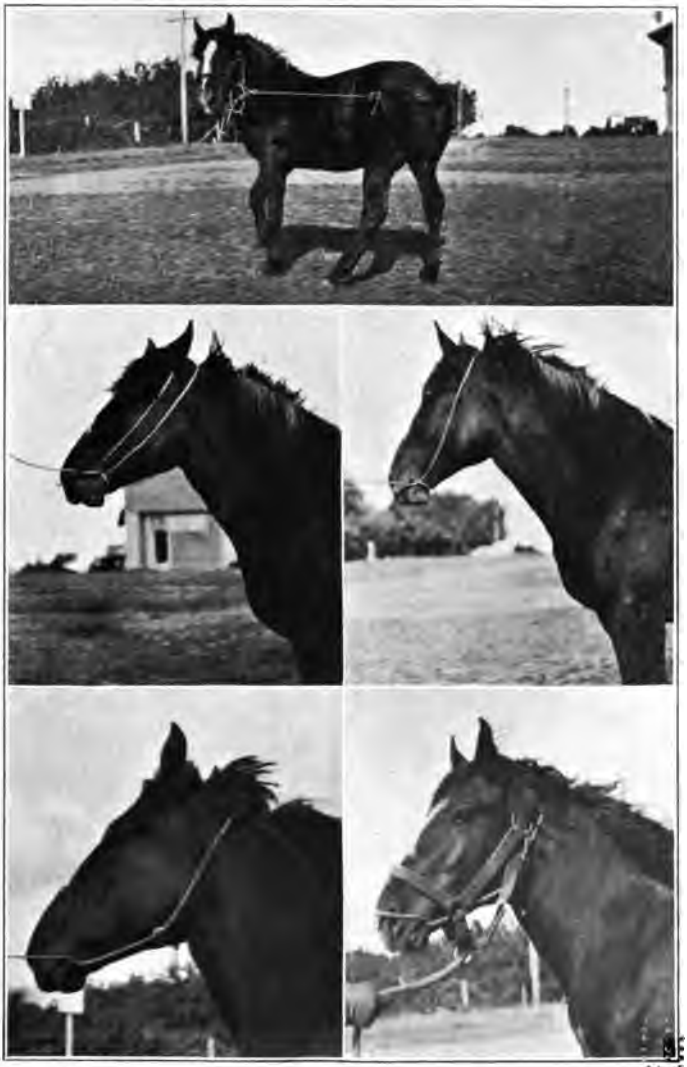


PLATE XIV. — SPECIAL APPLIANCES FOR BREAKING HORSES.

Above, Galvayne appliance in use; center left, the war bridle; center right, the modified war bridle; below left, guy rope; below right, guy rope with halter.

usually very severe, and many of the best horse trainers will not use them on this account. These methods will master a horse, but unless the horse-man uses good judgment, they may break the horse's spirit. One of the most useful of these devices is known as the Rarey Tackle. This is made by using a surcingle of heavy leather which has three strong rings attached three inches apart under the chest. Two heavy straps with rings inserted are made to buckle around the pastern of each of the fore-legs. Then a light three-eighths-inch rope is used in lacing this arrangement up, starting on one of the outside rings, running the free end down to the foot, back to the middle ring, down to the other foot, and back and tie to the third ring. The free end of the rope comes back so as to be of sufficient length that the man handling the horse can hold it without getting close to the horse's heels. This tackle should only be used on soft ground unless the horse is protected on the knees by heavy pads, as the throwing of the horse on hard ground would injure the knees. These tackles should not be used to throw the animal suddenly, but the restraint should be put upon him gradually. If the horse refuses to be controlled by the halter or guy rope, then the pressure should be put upon the fore legs, throwing him to the knees and to the ground, where he should be held until he gives up. Then he should be allowed to get up, and if he will not do as desired, it will be necessary to put him down again. After a horse has been thrown once or twice in this manner, a slight pressure upon these ropes, showing him that they are still present and may be used, is all that is usually necessary. They are very often used upon horses driven that are unmanageable otherwise, and especially if they are addicted to backing or running.

Another device that is very useful in subduing vicious horses is the Galvayne appliance. In this a rope is attached to the tail by a series of half hitches so that it will not come off, and has sufficient length remaining to extend to the halter. The horse's head is then turned around and the rope which is attached to the tail tied short into the halter so that the horse's head will be cramped to one side. He is then turned loose in the soft dirt of the corral and allowed to whirl himself around until he becomes more or less sluggish. After this he is allowed to straighten himself out and put back to work. If he still fights another treatment should be given. This is a very handy arrangement in that it uses the horse's own energy and will power to help subdue himself, and it is very efficient. (See Plate XIV.)

A bridle, known as a war bridle, is often used in the controlling of the wilder horses. This is made with a soft rope three-eighths of an inch in diameter and about twenty to twenty-five feet long. A small loop is tied in one end just large enough to go in the horse's mouth and around the lower jaw. This is placed in the animal's mouth with the knot and free end on the right side, bringing the free end up over the head and down through the loop in the mouth, thus completing the bridle. A modification of this may be made by putting the free end again over the top of the head from left to right, around the right side through the mouth, and then through the part which passes over the head. The severity of this last hitch may be increased by putting the rope which passes through the mouth last just under the upper lip, thus forming a twitch. A bridle of this kind should only be used when absolutely necessary as it can be very severe. All of these hitches are useful, but can be made instruments of torture if they

are put in the hands of a man who loses his temper. As such a man should not attempt to break horses, we do not hesitate in recommending their use.

STABLES AND SHEDS

Barn or shed room for young growing stock is especially needed for protection from rains and severe storms. Formerly it was thought that the young stock should be pampered by keeping them in close quarters. Good horsemen are realizing more than ever that the outdoor system of raising young stock is the most practical and successful under average conditions. In this system the aim is to provide shelter where the animals can go in case of storms or bad weather of any kind, and to arrange it so that the colts can be outdoors most of the time. Even in stormy weather, it is surprising to find how much time the colt will spend out in the open weather if given his own choice in the matter. An arrangement of this kind can be made in the horse barn or by having a shed adjacent to it. One method is to have a series of single stalls facing the center feed alley where the colts may be tied up during feeding time, so that if grain is fed, the colts which are stronger will not get the major portion. The side of the barn can be made in the form of an open shed or closed with doors to open on a lot. If there are halters on the animals so that the ropes may be snapped and unsnapped from the front, it is seldom necessary to go into the pen where they are. A similar arrangement made without the stalls is better liked by some, as it takes less room to a colt and provides more freedom of movement.

CHAPTER XXI

THE STALLION

GOOD sires have wrought a wonderful improvement in the quality of Western horses, and the margin of profit between the cost of raising a good pure-bred stallion and the income derived from the increased value of his colts has been tremendous. This margin, however, has been largely lost to the farmers, owing on the one hand to the exploitation of the business by dealers and on the other to the indifferent care given the stallions themselves. The stallion business is a fertile field for improvements — improvements that cost little money and bring big returns.

METHODS OF BUYING

Two general methods of purchasing stallions are preferable to most persons. These are privately owned stallions which stand for public service throughout the neighborhood, and company stallions which are owned by a company of neighbors who join together and purchase a horse. Of these two systems the first is preferable, and is coming into practice to a larger extent. The company stallion has generally proved unsatisfactory, except in cases in which the men have formed their own organization. If the company waited for some salesman of a distant stallion dealer or importer to organize them into a company and then sell

them a horse at an inflated value, there has generally been dissatisfaction on account of the high price of the horse, or disagreement among the individual members of the company. Occasionally such a system has proved satisfactory, and it can be recommended only where the individual members are not able to buy a stallion in any other way, and where a few horse-men can get together and agree on some horse which they wish to buy.

The time is at hand when the buyer should take the initiative in regard to purchasing a stallion. At present, $1500 in the hands of a buyer who knows what he wants will purchase a horse from the breeder or dealer that would cost him $2500 or $3000 from the dealer or stallion salesman. At the same time he can secure a wider range of selection and therefore buy a horse that more nearly suits his conditions. In practically every section of the West there are some pure-bred breeders who have good foundation stock, and who are selling pure-bred animals at so low a price that one cannot possibly afford to use a grade or mongrel sire. The dealers are also selling horses at reasonable prices, especially when the buyers go to the farm and offer cash. There is no one factor that will increase the general merit of the commercial stock produced as will the going of the buyer to select the stallion. Pure-bred horses of merit cannot be bought at grade prices, but $3000 should not be paid for the average horse and nothing but a stallion which is good enough to go at the head of a bunch of pure-bred mares can be purchased at that price and money made on the deal.

The European War has barred the American horsemen from using imported stallions to any large extent. Previous to the opening of the war, there was a fictitious value placed on the word "imported" and now that such

horses are scarce, the dealers who own a few have tried to make it of greater value than ever. The American horses produced at the present time are often far better than the horses which were imported prior to 1914, as many of the imported ones were a cheap class of horses which were sold on the reputation of the better individuals. Since European stock has been brought to this country, some excellent animals have been imported and have been used for the foundation of the breeds in this country. The American-raised stock, therefore, contains much of the best blood of the European countries, and in addition they have been raised under American conditions and are therefore acclimated. But even in this case, an American horse of equal merit with an imported horse, both from the standpoint of conformation and breeding, would not sell for as high a price as the imported one. The present supply of imported horses is low, and therefore the American horse is being forced on the American public. It is now the business of the pure-bred breeders of this country to develop their horses to the utmost, to castrate the poorer individuals, and further to develop this home trade which is now becoming firmly established.

A factor which has been of immense value in putting the pure-bred horse properly and consistently before the public has been the stallion license laws. These laws are the outgrowth of a demand from the public for a correct representation of the stallion's breeding and soundness. In most laws these factors are the points that have had the most prominence. It has been necessary to submit the breeding of the horse to the stallion board, together with a veterinarian's certificate of soundness. A license is then issued, showing the correct breeding, and if the horse is afflicted with hereditary unsoundnesses, he is either barred

from license, or the unsoundness is posted in a conspicuous manner upon the license. The licenses are required to be posted in public places so that breeders who patronize the public service stallion can be truthfully informed in regard to the breeding. So many states now have such laws that they cover the larger proportion of the horse-producing sections. Throughout these states there has been a strong tendency toward increasing the number of the pure-bred sires, and decreasing sires with unsoundness and poor conformation. The stallion laws have also provided a lien upon mares bred. This furnishes the stallion owner with protection so that he can collect service fees and therefore put his investment on a more substantial basis.

FEEDING IN THE BREEDING SEASON

The feeds needed by a stallion during the breeding season correspond closely to those needed by a growing animal or the brood mare that is suckling a foal or developing a fœtus. In view of the large amount of albumen that is in the semen, together with the nervous strain of the breeding season, foods are needed which contain a considerable amount of protein, and in order that the stallion's system keep in good physical bloom, these feeds should have a cooling effect. Feeds which meet these requirements especially well are oats and bran. The bran will tend to keep his bowels open, and therefore make him less likely to have trouble with leg or skin diseases. Roots, when they are available, form a very valuable addition to the ration if fed in limited quantities. Fresh-cut grasses or pasture are also valuable as either roots or grasses tend to keep the bowels in good condition and the horse healthy. For hay, a mixture of timothy and clover is very satisfactory.

The amount of grain that the stallion requires will be from one to one-and-one-fourth pounds a 100 pounds of live weight, with about a similar amount of hay. In order to keep the stallion doing well, he will need to have considerable work of one kind or another, as it is impossible to feed the horse heavily and keep him in good condition without exercise.

CARE IN THE BREEDING SEASON

In the breeding season, many of the stallions are peddled; that is, taken from one barn to another where the mares are to be bred. In a circuit of ten miles or thereabouts the horse will receive plenty of exercise in this way. Some breeders lead their horses with a saddle pony, while others drive them to a cart, or in some instances ride them. The saddle pony is the more convenient and saves much hitching and unhitching, but of course it means the maintenance of an extra horse. When the stallion is kept at home during the breeding season and the mares brought to him, the question of exercise is more serious. It will be necessary to give the horse at least a five-mile walk each day, either hitched to a cart or led with a saddle horse. This is a disagreeable task, but must be done if the horse is to be a sure foal-getter. If at any time he shows signs of being slow in serving or uncertain, he should be given still more exercise. Some horses have to be worked hard before they are sure breeders. One should not use drugs or dope of any sort. The horse should be given plenty of good feed and exercise and kept clean. If then he becomes sick, a veterinarian must be called. One should not try to treat a good stallion oneself, as he is too valuable an animal.

The grooming of a stallion presents problems that are not common with other classes of horses. In addition to tending to his coat, as mentioned under "Work Horses," it is necessary to take good care of the sexual organs, as they will become filthy and require washing and cleaning. Two general methods are advocated for this, and either is quite satisfactory. One is to take a bucket of warm water and ivory or castile soap, and thoroughly cleanse the sheath and adjacent regions. The other method is to use wet bran and pack in the sheath and let it gradually work out. It will carry out a large part of the dirt and filth with it. Some persons advise using a mild antiseptic on the penis after the serving of each mare. This tends to cleanse the organ, but one cannot expect this to prevent the horse from becoming diseased if the mare is diseased, on account of the large number of wrinkles which will not be thoroughly cleansed. The only way to keep the horse free from disease is to watch the mares and keep the stallion off the mares that are questionable.

FEEDING AND CARE OUT OF SEASON

The best system of management for the stallion out of season is that given to the gelding. That is, three fairly heavy feeds a day, and a good day's work six times a week, and rest and light feed on Sunday. The feed need not be as heavy as during the breeding season, and three-fourths of a pound of oats for 100 pounds of live weight is sufficient grain unless the stallion is doing extremely heavy work. The stallion should not be in a condition so that he would need to be reduced in flesh, as many stallion men practice. If he is exercised regularly with some form of work, and fed in the way the gelding should be fed, he will be in the

best possible physical bloom. More stallions are injured in the winter through lack of exercise and heavy feeding than by any other method. Too many are put in a box stall when the season is over and never taken out until the next spring except occasionally to clean the stall. The appearance of some stalls would indicate that he was seldom taken out even for this purpose. The result of such practice, together with too much feed, is that the horse becomes fat, sluggish, and out of condition. Nothing can be expected the following spring except an unhealthy horse and an uncertain breeder. The stallion should be broken to work young, but should not do much until he is mature. The breaking of a stallion should be conducted the same as for the gelding except that the stallion is stronger and more spirited, although less likely to be frightened than the gelding.

HANDLING THE SERVICE STALLION

A reliable man is a good investment in handling the service stallion. There are several reasons for this, the most important of which is that a good horse represents a large investment, and therefore must be handled carefully, and second, the patrons who use the horse are largely influenced to do so by the personality of the stallion keeper. One reason why the grade and mongrel stallions have made such inroads on the business of the pure-bred horse is because of the methods of salesmanship which some of the owners have used. The inroad is not entirely dependent on the difference of service fee, but that is usually a strong point. The service stallion is a business proposition and as such should be handled as a business. The patrons will appreciate the horse better if he is in good physical shape, well groomed, and

properly cared for. They will also appreciate courteous treatment and will be especially pleased if the stallion man keeps a close check on the time the mares are to be tried or bred. Stallion men are notoriously slipshod in their business dealings and a change from such methods is good business.

The young stallion at two years of age should not breed more than eight or ten mares during the season, and the mares should not come oftener than four or five days apart. Well-developed three-year-old stallions may cover twenty to thirty mares a season without injuring themselves, but should not be bred oftener than three times a week. Forty to fifty mares may be bred by a four-year-old. One mare a day, or perhaps three in two days is all that he can cover. A mature stallion may make two covers a day. If bred oftener, the semen frequently contains very few spermatozoa and the stallion is sure to be a better breeder if not used so often. The number of mares that the mature stallion may breed will, therefore, depend largely on the length of the season. Artificial impregnation is increasing the number of mares that the stallion may cover. In this method it is common for the stallion man to announce that the mares will be bred at eight o'clock in the morning, and have the mares assembled at that time. Then the mares are tried and those in heat assembled so that they may be bred artificially. A mare which is in good physical condition and normal in every regard is used as the mare for breeding. Part of the semen is then taken from her and used in the other mares.

BREEDING EQUIPMENT

Every man who handles a stallion should have proper equipment for safe breeding. This consists of a suitable

place for trying and breeding the mare, some type of restraining apparatus for the mare, and a substantial stallion bridle. Mares are very likely to kick when they are being tried or teased. The commonly used teasing pole does not fully protect the stallion, and a much safer arrangement is a solid wall about three feet high and about twelve feet long. Its top should be broad, rounded, and smooth. A good pen in which to confine the foal should be near by, probably directly in front of the mare. Mares in foal are much quieter if the foal is in sight. A breeding stall is also used by many, and is found quite satisfactory. This is made by setting two posts, four feet apart, with a removable bar between them for the mare to bump against. From the posts a side rail is placed so that it will go on each side of the mare and keep her from moving from one side to the other, but low enough to be out of way of stallion and attendant. (See Fig. 32.)

Breeding hobbles should be used on every mare that is at all nervous or excitable. Even the gentlest of mares sometimes kick unexpectedly. If a stallion is good enough to use as a sire, he certainly deserves full protection. The best type of hobbles consists of a strong neck band or collar with connecting ropes which pass through straps around the hocks. Those that fasten around the pasterns hold just as well, but the ropes are lower, and the mare or stallion is more likely to become entangled with it. It is usually advisable to fix the hobbles in position before the stallion is brought in sight, for nearly all mares are nervous when the stallion is near.

If the stallion has been properly trained and handled, a strong bridle with a plain bar bit and leading rein with a chain in one end is sufficient for controlling him. The chain should be passed through the ring on the near side

under the chin, and fastened to the ring on the off side. Tough-mouthed and head-strong horses sometimes require more severe apparatus. The following apparatus

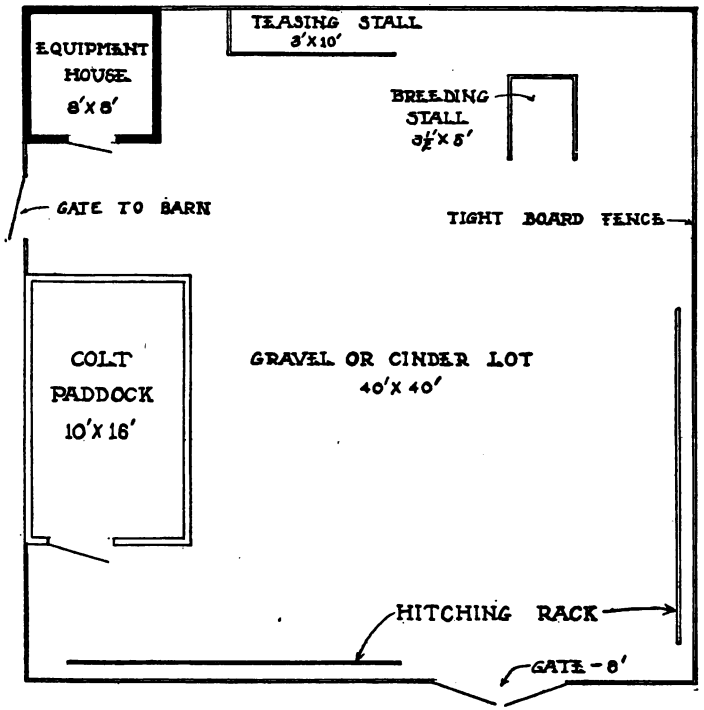


FIG. 32. — A Satisfactory Arrangement for the Breeding Lot.

is successful with horses of this type. An iron rod three-eighths of an inch in diameter and eight inches long is fitted with a ring in one end and a snap in the other. The end with the snap is fastened on the off side of the bit, with the rod running through the near side. The

lead rein is then fastened to the ring on the free end of the rod. A heavy twisted bar or snaffle bit should be used.

In addition to the equipment above, the modern stallion owner is equipped with an impregnating outfit and gelatine capsules, even though he does not make a regular business of using artificial impregnation. There will be occasions when many mares will come for service at the same time, and unless he is situated so as to take care of them by this means, many of them will be forced to some other stallion, or his stallion will be forced to breed oftener than advisable if he is to be a sure foal-getter.

STABLES AND LOTS

The breeding stallion on the best farms is not isolated from other horses. Isolation is likely to make him more crabbed and vicious, and also cause him to be much harder to control when around other horses. If but one stallion is kept on the place, it is preferable that he have a roomy box stall in the regular horse barn, adjacent to a large paddock. If several stallions are owned and kept at the same farm, a separate stallion barn may be kept for them. A horse that is isolated from others, in addition to becoming vicious, is more likely to develop habits of cribbing and masturbating.

The stall for the stallion should be of box form, not less than fourteen by fourteen feet, and absolutely solid in construction, with smooth walls. There are differences of opinion in regard to mangers and feed-boxes. Some prefer a small feed-box for grain in one corner, with a slatted hay-rack placed high from the floor. Others use a type of smooth manger across the corner of the stall, so as to have no sharp edges. If a manger is built it

should have no opening in front, since the horse is likely to try to get over it and hurt himself in the effort. To prevent him from rubbing his tail, the walls of the box should slope one foot from the bottom. A good way to accomplish this is to nail a two by four on the floor. This two by four should reach entirely around the stall, and be a foot from the sides. Boards four feet long should be taken and set on end, the upper end against the wall and the lower end against the two by four's. When nailed firmly one has a wall that will protect the outer wall, and also keep the horse from rubbing.

There must be an exercising lot wherever the stallion is located. This should be in connection with the stall, and should be roomy. It is even better if it assumes the dimensions of a pasture. To make a fence high and strong enough for stallions costs a little more than ordinary fence, but it pays. One hundred dollars will fence a good-sized pasture, and in many cases it will be repaid the first year by the larger number of colts obtained. Exercise for the stallion pays returns more quickly than it will with any other animal. Many stallions are changed in a few days from non-breeders to good foal-getters by giving plenty of work.

ADVERTISING

In order that the investment in a good stallion be justified by a large amount of business, it is essential that he be properly placed before the public by liberal advertising. There are three requirements to a clear concise poster: the name of the stallion and owner; a statement as to the place of stand; the terms of service clearly stated. In addition to these three points, many of the states

require that a copy of stallion license be posted which will clearly define whether the animal is a pure-bred, grade, or mongrel. It is also well to include a picture of the stallion, so that persons who have not seen him will become acquainted with his general type and characteristics. If the horse has won any prizes and made a show record, these should be stated, as they are factors which should influence horse-men in breeding to him. It is also well to notify through the local papers in regard to the horse and to the place of stand. This is especially essential in the early part of the season, so that breeders will not be inconvenienced, and will be on the lookout for the stallion. Conservative advertising by these two methods is productive of good results.

BREEDING TERMS AND CONTRACTS

In order to insure prompt payment of services and to avoid misunderstandings, it is essential that the terms of service be clearly defined. The common terms of service are single leap; by the season, with or without return privilege; insure the mare to be in foal; and to insure a living colt to stand and suck. The terms of service which are to be used should depend largely on the customary practice in the locality. Usually when the single leap is $10.00, the season without return privilege is $15.00, insure in foal $20.00, and to insure foal to stand and suck, $25.00. These will be approximately the ratio of the various terms of service, as figured on the net average amount which the stallion owner will usually obtain. Stallion owners should everywhere encourage men to accept the season or in foal contract, as they tend to induce the mare owners to take better care of their mares, and

therefore reduce the liabilities due to dead foals, and the like which come from lack of proper care. Also the stallion owner will then not be troubled with mares which are not likely to get in foal, especially if the breeders use the season charge. Another advantage of the season charge is that it usually insures that the mare owners will return their mares with more regularity, and therefore give the stallion owner a better chance to get them in foal.

Stallion men now largely use breeding contracts consisting of a promissory note for the service of the stallion payable when the terms of the breeding service are fulfilled. This is signed by the owner of the mare, and therefore a more careful record is kept of it than otherwise. This will also make it possible to collect for the mares in a much easier manner than where no absolute record is kept of the service. The entire stallion business should be considered as a business investment and handled as such. This cannot be done except by the use of business methods.

CHAPTER XXII

THE RANGE HORSE

THE men designated as range horse breeders are those who use the range for the larger proportion of the feed of their animals, occasionally supplementing it with hay during the winter period. The range horse breeders are found over a large territory. Wherever cattle are raised, many horses will be found. The reason for this is that the cattle-men wish to raise the large number of saddle and work horses which they need for their own use as well as some surplus for sale. There are also many breeders who are strictly horse-producers. Throughout the range country, a decided change may be noted toward more cattle and sheep and fewer horses. There are several factors that have caused this movement, the principal one being the high price of cattle and sheep and the relatively slow market for range horses. In addition, there are the barbed wire fences which have, in some places, greatly handicapped the horse-men who let their stock run on the open range. The slipshod fences put up by the homesteaders kill and cripple many horses, especially when they are being chased by the homesteader's dogs. Even with a large number of breeders transferring to cattle or sheep, there are still many who will continue with the range horse. Horses winter out better than the other classes of animals and are therefore

popular on ranges where good winter pasture or feed is not available. Many of the smaller ranchers are breeding range horses, but these are of better type than formerly and it is easier to find a market for them. A marked change has come about in recent years in the general type of range horse. Formerly, the thorough-bred and standard-bred stallions were favorites on the range, due to the production of saddle horses, but at present, on account of the small demand for light horses, these animals are not meeting with favor and heavier-boned stallions are being used. This results in a more rugged type of horse which for wearing ability and constitution is hard to surpass.

RANGE MARES

During the breeding season there are two methods of handling the mares. One method is to turn them loose upon the range and let them run, usually with more or less herding. The other method is to turn them on adjacent ranges or pastures, but to drive them to the corral for breeding purposes and also to take care of the colts when necessary. The latter method is becoming the more general as it results in the use of a better class of stallions and while as many mares may not get in foal as when the stallions run loose with them, the percentage of colts actually saved is larger.

After the breeding season is over, the mares and colts are usually left free to seek their own pasture and very often they are not rounded up until fall as the colts are usually branded before the mares are turned out. The better horse-men herd their mares to some extent to keep them separated from other bands and on the better pastures. This treatment pays, as closer watch may be

kept on the bunch and more size obtained on the colts by the better feed. In the winter, if the pastures are good, the mares are left out for the larger proportion of the time. When the heavy snows come, they are sometimes put up but usually if they will winter through, they are left to do so. It is seldom necessary to feed for a long period in most sections of the West as the horses will paw out bunch-grass except where the snow becomes unusually deep. Hay should always be on hand to take care of this emergency. If the hay is not too high in price, good profit can be made by using some in the winter, as it will insure better condition of the mares and therefore larger percentage of foals in the spring.

RANGE STALLIONS

There are three general methods of handling the range stallion. One is to keep him up and bring the mares to him; another is to turn him loose upon the range and herd the mares and the stallion; and the other is to turn the stallion loose with the mares and let them run at will. In the past, the practice of the range was to turn the stallions loose with the mares, but with the advance of the draft sire, it has been found impracticable to do this, as he will not stand range conditions. The large stallion will tear up his feet and not keep in physical condition to do service if turned loose upon the average range. He also costs many times as much as the stallion formerly used and therefore represents a larger investment. Some of the more active of the draft sires will do fairly well if the mares are closely herded so as not to cover too much territory. The system that has been found most satisfactory by the breeders who are using the heavier class

of stallions has been to keep the stallions up and herd the mares, bringing in the ones which are in heat. This results in a smaller percentage of the mares getting in foal but a larger number of the colts that are dropped are saved, due to the better care which the mares are receiving. Another benefit of this practice is that the stallions may tend to more mares and especially the mares which one wishes him to serve. When the stallions are loose on the range, it is an all too common practice to drive mares to those that are known to be the best colt-producers, and therefore the better stallions are very often overworked and injured.

After the breeding season is over, the range stallion that is kept up is handled very similarly to the stallion in other places. Usually a large paddock or field is suitably fenced so that he may run in it and keep in good physical condition. If he is a light-boned stallion or one that will stand the range conditions, he is usually turned loose with the mares and allowed to roam with them. This method will often catch some of the mares that have failed to get in foal earlier in the year. It will also insure that the stallion receives plenty of exercise, which is not always the case when kept in close quarters.

GROWING STOCK

Different conditions of range necessitate different methods of growing the younger stock. The common practice, however, is to let the stock run, furnishing them with the hay that is absolutely necessary in the winter and gradually letting them attain their growth. Under this practice, the horses at four or five years of age will usually not weigh over 1000 to 1200 pounds. On the

other hand, some of those that are better fed in the winter on some alfalfa or wild hay will often attain a weight of 1300 to 1400 pounds, but it is seldom deemed advisable to feed hay in winter unless the horses absolutely need it. Horses that are raised in this manner will often increase in weight after they are put to work in other sections, especially if they are fed heavily on grain and leguminous hay.

The only time that the young stock are caught up is when they are branded and castrated. The castration is usually performed as yearlings, as the colts become a nuisance if allowed to go a longer time. As the horses are not handled until they reach maturity except as above mentioned, they are rather wild, but if they are from the draft sires, which are coming into use more and more, they do not require nearly the amount of gentling that will be needed if they are from hot-blooded stallions. The system of gentling in general practice has been given in another chapter. It is a common practice to sell the colts any time after they are four or five years of age, depending on general market conditions and the growth of the colts. They are rounded up, inspected by the owner or buyer, and any not fit are turned back on the range to grow or to develop more if they have it in them. The ones that are needed for use are cut out and broken. Some ranchers use the buckaroo method of breaking, while others go at it more systematically and try to gentle and win the confidence of the horses. The latter method is growing in favor.

CONTROL OF RANGE STALLIONS

An important problem with the range horse-men is the control of range stallions. The breeders who are

seeking to improve their stock are constantly worried with scrub stallions which belong to some one else, or by two-and three-year-old stallions that were not castrated when they should have been. In some states rigid control of these stallions is obtained by having special agents appointed to castrate them and providing fines for turning loose such animals upon the range. There is some agitation towards passing a law which would prohibit any but pure-bred stallions running loose upon the public domain. It is probable that it will be some time before a law of this kind is put into actual operation, but it is certain that in the near future the range-men will ask for laws doing away with the scrub stallions.

CHAPTER XXIII

THE PURE-BRED

SINCE pure-bred horses will perform the farm work and at the same time breed and raise high-priced colts, they offer a strong inducement to those who are interested in raising a better class of stock. The handling of pure-bred stock as compared with grade stock offers larger returns from a larger investment and better care. The pure-bred horse should not be owned by the man who does not have the desire and ability to take care of horses in the proper manner. If the man is a successful raiser of grades, the breeding of pure-bred animals of like type offers a good opportunity, for with somewhat larger investment in the original stock, he receives larger returns from the young stock on account of their breeding and the better care which they receive.

Handling pure-bred horses requires a man with three qualifications. He must be a competent horse-man, a good judge of live-stock, and a thorough business man. A good horse-man is needed, as the future success of the business depends on the ability to raise good stock and to take care of them properly. A good judge is necessary in the selection of the breeding animals and in the pricing of their produce. Other than a good judge will not select the type of animals which are demanded on the market. More than the average amount of business ability is re-

quired in the recording of pedigrees, buying, and especially the selling of pure-bred horses.

Three large problems confront the average small breeder of pure-bred horses. These are salesmanship, sires, and feed and care. The producer of grade horses is accustomed to the buyer coming to his place and offering him a price for his stock, which he accepts or refuses as he sees fit. The pure-bred buyers seldom proceed in this way at the present time. They expect the seller to find them. At present the law of supply and demand does not trouble the pure-bred breeder as much as getting the supply to where the demand exists. Good sires are also a problem of the small breeder. They are high-priced and unless there are other pure-bred mares in the neighborhood that will pay a higher service fee than the ordinary grade stock, it is sometimes inadvisable to pay the price necessary to buy the type of animal really needed at the head of a pure-bred herd. Feed and care as given on the average American farm will not produce the maximum development. The horses which are imported from foreign countries or those which are bred and produced by large dealers and breeders in this country are developed in the best manner possible. These animals present a better appearance to the buyer, and therefore demand a higher price than the average stock raised. Therefore, if the small breeder is to raise pure-bred stock, he must give them every opportunity to develop into the best type possible.

FOUNDATION MARES

It is essential to consider the type of horses which one wishes to produce when selecting the foundation mares for the production of pure-breds. The type demanded

by the draft horse buyers at the present time is an animal with soundness, ruggedness, and the general characteristics of serviceableness stamped upon her body and with a certain degree of beauty. In selecting the mares, it is better to procure one or two good mares that will produce the type of stock which is salable than to buy three or four which are off-type, unsound, or which may fail to breed. It is not essential that foundation mares weigh a ton, as often the extremely heavy mares are coarse and masculine in appearance, and not as reliable breeders as those of average weight and more feminine appearance.

FOUNDATION STALLIONS

The sire of pure-bred horses is more than one-half the stock. The reason for this is that he has one-half the influence on the offspring, and in addition he is the advertising and sale feature for the entire bunch. Occasionally a mare will become noted for the kind of offspring which she produces, but the sire is invariably the animal which puts the breeder at the top with any kind of pure-bred stock. On account of this, it is essential that the sire be more than an average horse; in fact he should be an out-standing individual. More attention than usual should also be paid to the breeding of such horses, especially among breeders of draft horses. There are few draft horse breeders who are good judges of pedigrees.

PEDIGREES AND REGISTRATION

A pedigree in the broadest sense of the word is a record of ancestry. In common use, however, the term is applied to the published record of breeding and ancestry issued by some association, organized for the express purpose

of recording and publishing such pedigrees. The different breeds of live-stock which now have associations organized for the recording of pedigrees have all developed in a more or less similar manner. Breeders find that a certain strain of animals fits their needs better than any other, and continue to use that strain, constantly selecting the best. After a course of years this strain becomes distinctly different from other animals of the same species. Not only are these animals themselves different, but they transmit these differences to their offspring. The men handling these animals finally realize that they have something different and perhaps of real value, and so begin to think of perpetuating it, thereby forming a new breed. A breed, according to the generally accepted definition, is a race of animals having a common ancestry and possessing common traits that are transmitted by heredity. As interest in the new stock grows, a permanent record is kept of the best animals and their offspring. Sometimes this is handled by private parties, but usually a small association is started for the purpose. The animals first recorded are called "foundation" stock. They are not admitted according to rule, but on the judgment of the association. All the offspring of such foundation stock are eligible to record on the books of the association. It is also customary in the beginning to accept animals for record which are largely but not entirely of the blood of these foundation animals. Foundation stock may be taken into the records of the association for some time, but usually for only a few years, when the books are closed, and no more foundation stock is admitted. After this time animals are often registered if they have a certain number of top crosses. Some of the horse associations still register animals with

five top crosses. This means that the animal to be recorded has been bred up from scrub stock by the use of five pure-bred sires in direct succession, thus making the animal $\frac{31}{32}$ pure-bred. Now, however, this rule is abolished and nearly all the leading breed associations record only the offspring of sires and dams already registered.

Methods of recording.

In recording animals with the association, blanks or forms printed by the secretary are used. In the application, it is necessary to give the name and number of the sire, name and number of the dam, signature of the breeder as to the service and the time of foaling, and complete color markings of the colt. If the animal is registered under the top cross rule, it is necessary to give his entire pedigree, tracing back to the sixth generation in most cases. When an animal is accepted for registry, it is given the name which the breeder suggests and a registration number, or in some cases assigned a certain volume and page on the record. The secretary of the association then issues a certificate to the owner, which shows the information in regard to the animal's breeding, the color markings, and the like, and certifies under the seal of the association that the animal has been duly recorded on their books. Such a certificate is known as certificate of registration, or more commonly as a pedigree. These certificates usually show, in addition to the sire and dam, the other ancestors for several generations. The names of the animals are in all cases accompanied by their registration numbers or by the volume and page of the book in which they are recorded. When the number or page is not given, the ancestor in question is not recorded. In case of grades admitted under top cross

rules, the unregistered dams will have no number, although their names will usually appear. When the animals have been registered in foreign countries, the foreign registration number will always accompany the American number, but will be in parenthesis. Canadian numbers will be put in brackets. In addition to such certificates of registration, the secretary of the association publishes all such pedigrees in a book, which is called a stud-book. The volumes of such books are published as often as there are sufficient number of pedigrees to warrant it. With our leading breeds of horses, there are from ten to twenty volumes published.

Recognized associations.

In the stallion business there have been many fakes in pedigrees or certificates of registry. This has led to a closer study of the breed associations to determine which are reliable in their methods of recording and which have rules stringent enough that the animals registered may be considered pure-bred. The larger number of the stallion registration laws allow pure-bred licenses to animals registered in the following associations. Animals recorded in other associations are considered of doubtful breeding.

American Association of Importers and Breeders of Belgian Draft Horses, Wabash, Indiana.

American Breeders and Importers Percheron Registry, Plainfield, Ohio.

American Breeders Association of Jacks and Jennets, Columbia, Tennessee.

American Clydesdale Association, Union Stock Yards, Chicago, Illinois.

American Hackney Horse Society, New York.

Percheron Society of America, Union Stock Yards, Chicago, Illinois.

American Saddle Horse Breeders Association, Lexington, Kentucky.
American Shetland Pony Club, Lafayette, Indiana.
American Shire Horse Breeders Association, Wenona, Illinois.
American Studbook (Thoroughbred), New York.
American Trotting Register Association, Chicago, Illinois.
American Suffolk Horse Association, Janesville, Wis.
Cleveland Bay Society of America, Oconomovoc, Wis.
French Coach Horse Society of America, Oak Park, Ill.
French Coach Registry Company, Columbus, Ohio.
German Hanoverian and Oldenburg Coach Horse Breeders Association, Lafayette, Indiana.
Morgan Horse Register, Middlebury, Vermont.
National French Draft Horse Association, Fairfield, Iowa.
Standard Jack and Jennet Registry, Kansas City, Missouri.
Welch Pony and Cob Society, Aurora, Illinois.

Methods of misrepresentation.

Bogus or fraudulent pedigrees for horses have usually come under one of the following classes: 1. Pedigrees or certificates of registration issued by associations or companies without recognized standing; 2. Certificates or pedigrees issued by recognized associations upon misrepresentation of the owners of the horses; 3. Pedigrees which are correct in themselves, but which do not belong to the horses with which they are associated, the original horse having died and a grade having been substituted; 4. Pedigrees which have been changed in the age or description of the horse in order to make them fit another horse than the original for which the pedigree was intended. All of these methods of misrepresentation have been discovered by the stallion registration boards of the various states. It is probable also that such misrepresentation is practiced with other classes of live-stock, but on account of the higher value of horses they have

been more closely checked. The breeder in buying a horse should either study up carefully on the matter or have the pedigree passed upon by the registration board of his state or some one who is entirely familiar with such problems.

FEEDING AND CARE

The pure-bred horse, in order to be profitable, must be given every chance to develop into the best type possible. The size and development of the pure-bred greatly influence the sales and price. Therefore, the feeding of the pure-bred should be similar to the grade, except that it is more important that the animals be given every chance for development. If the pasture falls short, grain or good hay should supplement it so that the animals may be kept growing. This is especially important with the foal and the yearling, as it is impossible to make an 1800- to 2000-pound horse out of a stunted colt. The best that feed can accomplish after a yearling is stunted will be to produce about a 1600-pound horse. The general requirements for growth are the same as outlined in Chapter XX. Fitting for show and sale will be taken up later.

The pure-bred colt must be properly trained and broken at an early age so that he will be easily handled, and therefore will receive better care. The breeding of pure-bred horses is but one-half of the problem. The other half is the feeding and care, and the larger number of pure-bred breeders in America fail more in this field than they do in the breeding.

The weight and development of pure-bred draft horses obtained by the leading breeders is shown by the following table of weights compiled from the first and second

prize winners of the Percheron classes at the Chicago International in December, 1913.

	Aged	3 Yr. Old	2 Yr. Old	Yearling	Foal
Stallions	2292	2075	2110	1780	990
Mares	2065	1977	1757	1522	987

The futurity winners of the same exhibition show that these weights are fairly representative, as eight yearling stallions averaged 1657 pounds and seven mares averaged 1491 pounds.

These figures are important as they show the early development of the draft horse that is absolutely demanded by the modern show and sale ring. They also demonstrate that under good feed conditions the two-year-old is practically a developed horse. This is more true with the stallions than the mares.

A 1400- or 1500-pound two-year-old would be considered under farm conditions a big horse, but in competition with a fully developed two-year-old weighing a ton, such colts are immature and undeveloped and cannot be expected to win in the show ring or sell for a high price.

EQUIPMENT

A large barn, showy harness, and an extensive establishment are not necessary to produce good pure-bred horses. The main advantage of such equipment is in selling, for it makes a good impression on the buyer and shows off the horses to better advantage so that men with

such equipment receive higher prices. On the other hand, they must receive higher prices to pay interest and depreciation on the investment. On account of this very often pure-bred animals of the same merit can be purchased from the small, poorly equipped breeders at a lower price than from the larger breeders and dealers. The real essentials are barns and lots which are handy and comfortable, and which give the horse opportunity for proper development. The equipment in addition to this must be charged to the marketing end of the business. Under the present conditions of selling, it is usually possible to make a profit on good equipment, especially if the breeder is operating on a larger scale, but any breeder will find it profitable at least to keep his barns and fences neat, clean, in good repair, and well painted.

THE SHOW RING

In the development of pure-bred horses, the show ring has had a significant place in putting them before the public and in demonstrating type and values. The show ring has also exerted much influence in the education of the breeders. Usually the judges at the larger fairs are capable, and showing under such men and studying their placing is one of the surest methods of fixing the correct type in mind. Usually a breeder's stock looks very good to him until he takes them in the show ring, where he quickly sees that he still has much improvement to make. The show ring has also an extended advertising value and the value of the animals is greatly increased by the winnings at the large fairs. In the future the show ring will continue to be a prominent as well as essential factor in the pure-bred horse business.

ADVERTISING

The breeder of pure-breds, if he is operating on a paying basis, must conduct his affairs on better business principles than the average producer of grade horses. Two established principles that he must adopt are conservative advertising and salesmanship. In the pure-bred horse business the demand must be developed, since the seller must hunt the buyer. There are many ways which will tend to develop this demand. The essential feature is advertising or publicity. The show ring is the leading method of advertising. Winning at the fairs will put the stock before the public by newspaper mention, by persons who see the stock, and by various comments and criticisms that disseminate one way and another through the live-stock breeders. The county fairs, the state fairs, and the larger international fairs are important advertising centers, as each of them reaches a certain class of potential buyers. Usually the prize money will approximately pay traveling expenses, and the care and fitting are usually more than paid by the advertising and the development of the individuals. The advertisements which are run in the agricultural press are also important. For the smaller breeder, it is usually advisable that a breeder's card be inserted in the papers which reach the customers with which he is most likely to do business. It is not usually advisable to put in big, flaring advertisements, but a conservative yet attractive card, which is inserted with some degree of regularity, will more probably produce the business. Advertising with the papers will also aid in getting the animals written up by the newspaper men when at the shows and exhibitions. The essential in all advertising is to place the

animals and the name of the breeder before the public in a way that will show them that the stock produced is good, reliable, and worth the money.

SELLING METHODS

Salesmanship is essential in handling pure-bred horses. There are four general methods of selling which are used. One which has been worked to some extent in the past is the company stallion plan. Under this method the stallion is sold to a group of men each of which is part owner. The original idea of the company stallion system was to supply a good horse to those who individually could not afford to buy. This part of the plan was excellent but the system as a whole has been subject to many serious abuses. At first the system met considerable success, but is not proving satisfactory in most sections, not because the idea was incorrect, but because of the abuses. The first complaint usually comes from the fact that the salesman employs an influential man in the neighborhood to aid in the selling by giving him one or two shares. The second is that usually only one or two reliable men sign the notes while the remainder are poor pay, and therefore it falls on a few to pay the entire amount. Again the method of selling is so expensive that the stallion must bring a considerable amount above his actual value in order to pay for the shares given away and for the profit and expenses of the salesman and his grooms. Also it might be well to note that the class of stallions sold by this method are usually of an inferior grade, as the better class are picked up by the buyers who deal direct with the breeder or dealer at their barns and thereby have an opportunity to select the better

individuals and to save the enormous commissions and salesman charges that are necessary under the company plan. These abuses of the system usually offset the advantages. The companies that are really satisfactory have often joined together of their own volition and bought the stallion direct from the breeder or dealer. Such companies are most satisfactory when the number of members is small and when they are men that can work together.

Another method which is being encouraged at the present time is selling direct to the buyer. The proper development of the pure-bred horse business depends largely on both the buyer and seller. If the business can be developed so that the buyer takes the initiative, as with other kinds of live-stock, it will be a great benefit to the stallion and mare trade, and will also be one of the most potent factors in the improvement of the grade horses throughout the country. This method requires that the buyer develop more or less initiative and that the breeder be advertised so that the buyers will know who they are and what kind of stock they can obtain.

Many breeders sell direct to dealers, who in turn advertise the horses and sell to the ultimate purchaser. This method is a very good one and one that probably always will be used. The stallion dealer is gradually taking up this method instead of importing as he has done in the past. When such a trade can be worked up, it will be for the benefit of the small breeder, as it will give him a reasonable market for his stock. He cannot expect to receive as high a price as he would if selling direct to the ultimate buyer, but should obtain a good profit on the animals produced. Selling horses requires considerable ability on the part of the seller and entails

heavy expenses, so that the salesman must have some of the proceeds.

Coöperative selling is helping the small breeders in some localities. When there are several small breeders together, they sometimes form a local association and advertise accordingly. If they are somewhat scattered, then sale lists are prepared and the advertising done by means of a secretary who helps the buyer to locate the kind of stock which he wants, and aids the breeders in marketing their pure-bred stock. Such methods are bound to advance more in the future, as they increase the sales and at the same time lower selling expenses.

CHAPTER XXIV

FITTING HORSES FOR SHOW AND SALE

HORSES may be well bred but they must be well fed, fitted and shown in order to receive the recognition that they deserve. In addition to bettering the appearance of the individuals, the practice of properly fitting and showing animals is a custom which the public expects. The majority of people are not able to recognize the real value of a horse if he is thin in flesh, and even those that do recognize this value feel that their expert knowledge entitles them to buy for less than the true value.

FATTENING

The most important point to be considered in the preparation of horses for market is to have them properly fattened. Many breeders keep their horses until they are ready to sell them, and then turn them to the first buyer that comes along, regardless of whether they are fat or not. Many horse buyers, however, will not buy horses if they are thin, regardless of the price. If they do buy them, they will not pay the price they would otherwise. Horses should have at least fat enough to give them a smooth appearance and considerable weight. Experiments show that the value in the weight of a horse above 1600 pounds is worth from 25 to 50 cents a pound, and as this weight will cost but 8 to 11 cents a pound

to put on, there is profit in fattening horses for market from the standpoint of weight. The draft horse market is a peculiar one, in that weight is one of the more important factors in determining the price.

In fattening draft horses, it is common to stall-feed. The reason for stall-feeding rather than lot-feeding is because the horses when highly fed will often kick and injure one another to some extent. The horses will also make quicker gains when kept up than when allowed to exercise as much as they naturally would. The horses are put in the barn and started on feed gradually. Great care must be exercised for the first few days not to put them on feed too rapidly, as they are somewhat susceptible to colic. A common method in the larger feeding establishments is to feed them three times a day at first, and gradually increase to a full ration and five feeds a day. The reason for feeding so many times a day is because the horse has a small stomach and so he needs food in smaller quantities and more often. Hay is kept before the horses practically all the time, and is usually fed immediately after the grain so as to cause the horse to eat all the grain possible. The horse should have all the water he can possibly drink, and preferably before he has the regular feed, so as not to hinder digestion by drinking a large amount. Oats, rolled barley, wheat bran, and oil meal make up the larger portion of the grain feed. Farther east, corn is used to a large extent. A mixture of rolled oats and barley of equal parts, together with from two to three pounds of wheat bran a day, will make a very satisfactory ration. The amount of bran or oil meal fed will need to be regulated according to the condition of the horse, as some will eat more bran than others. Bran is somewhat laxative in its general nature,

and is a very good feed for keeping the bowels open. Good, bright clover mixed with some timothy makes a most satisfactory hay. Plenty of it should be fed, as it will make belly on the horses. Care should be taken that it does not have dust with it, or it may injure the wind. In some sections alfalfa will form the main portion of the hay ration and when fed, very little wheat bran will be needed. It is advisable to feed as much barley as is safe, since it is somewhat more fattening in its general nature than oats. It should not comprise the entire grain ration, as it is hard to condition the horses on barley alone.

Horses being fitted for the market are seldom given exercise until a few days before they are shipped unless their legs show some filling. As a substitute for exercise, and in order to keep the blood in good condition and to prevent stocked legs, many use Glauber salts. These salts are fed twice a week mixed with the grain feed. Others use oil meal for largely the same purpose. It is a well-recognized fact that oil meal will aid in getting the skin and hair in good condition. Horses that are being fitted for show purposes instead of sale should be given a proper amount of exercise, since in the show yard it is especially important that their legs be clean and show no tendency toward filling. Show horses will also be fed much longer than market horses, and unless the proper amount of exercise is given, they will put their flesh on too soft. Before any horses are shipped, they should be given exercise for a few days. This will eliminate the possibility of azoturia. Horses are seldom curried throughout the entire feeding period, but this is done very thoroughly just previous to shipping time. As a horse becomes fat the dandruff and scurf of the skin will work

out upon the hair, so that it is a fairly easy matter to clean them up in good condition. The labor during the fattening period should be spent in bedding the horses heavily, and in giving them every comfort that is possible.

Many persons have doubted the wisdom of forcing horses in this way. They claim that the horses will not wear as long after being subjected to such a fattening process. It may or may not be true, but it does not seem probable that experienced buyers of work horses would buy fat horses for any length of time if they did not find them as serviceable as horses bought in a thinner condition. It is a well-known fact that fat placed on sound draft horses that are of good conformation will bring profitable returns for the feed. Hence it is policy for the horse-producers, if they are to make a profit on their draft horses, to get them in the best marketable condition, as with fattening steers or other stock for market.

BREAKING AND TRAINING

It is essential that the show horse be properly mannered. He should be taught to lead up freely at the right side of the leader and to stand properly upon his legs, without weaving over the show yard. Often the well-mannered horse will beat one of a trifle better conformation, but which does not show off as well. The animal is in the show ring but a short time and it is impossible for the judge to see all his points unless he is shown to the best possible advantage.

In teaching a horse to lead, the lead rein or strap should be held entirely in the right hand of the leader, and if the horse does not come up readily, a whip may be carried

in the left hand, which will touch him gently in the flank and rear quarters and teach him to come up by the leader. If the horse is unusually stubborn, it may be necessary to have an additional man for helper. The horse should not be trained to expect this man to follow, for often it is impossible to have him in the show ring, and if the horse is accustomed to him, he will not lead up well without him. A horse that will travel off free with a leader and without assistance always presents an attractive appearance. In turning the horse, care should be taken to stop before turning around, as the horse will form the habit of taking a large circle, and is also likely to slip and injure himself, as well as make an ungainly show. The larger number of horse-men prefer to have the leader turn around the horse, as the animal can be brought in a straighter line to the judge by such leading, and it will also protect the judge from the horse so as to avoid any danger from kicking.

Training the horse to stand properly on his legs requires patience. The horse should always stand on ground that is level or with the front feet higher than the rear. The horse should be stopped in the place wanted, straightened upon the hind feet, and then the front feet gradually worked into position. At first the horse will not know what is wanted, but with a little training and patience will readily acquire it. In getting him to pull his right front foot forward, pull the head to the left and forward, and vice versa for the left front foot. If it is desired to have the front foot placed back, do not kick the horse on the shin or foot, but pull the head back toward that leg, and at the same time place the hand upon the shoulder and the horse will readily learn what is wanted. After being placed upon his feet, the horse should be

trained to hold its head erect in a stylish manner. Playing with the bit and chain is not allowed.

BRAIDING AND TRIMMING

With light horses very little trimming is used in the show ring, as it interferes with the general appearance and quality in the horse. With the draft horses the custom is different. The decoration in common use on the manes is known as the Aberdeen plait. The diamond roll is used also but not extensively, as it is more difficult to put in, and is not liked as well by many show-men. There are three common methods of fixing the tail — the French tie and two braided ties.

In the Aberdeen plait colored yarns are used. Two skeins are employed, having colors that will harmonize with each other. Each skein should be straightened out and cut once. These skeins furnish sufficient yarn for one horse. A bit of yarn is given three or four wraps around the two colors and tied. This puts the ends in attractive condition. The yarn will be four or four-and-one-half feet long. The mane should be clean and well brushed out and combed to one side, usually the right. Small benches thirty inches high and four or five feet long are provided to stand on. The horse's head is held or tied up in show position. The worker should stand on the bench close up beside the neck, supposing the mane to be combed to the right, and facing the same way that the horse does. The braiding is begun two inches back of the ears. From the top of the mane a strand about as large as the fore-finger should be separated from the remainder of the mane and held up. Place this strand of hair between the two strands of yarn and draw the yarn down until the knot rests firmly against the

strand of hair. Draw the left (yellow) strand of yarn straight along the top and right side of the mane. Toss the right hand strand (red) across it and let it hang down on the left side of the mane. Hold all in position with the left hand. Separate another strand of hair about the size of the little finger from the top of the mane just opposite where the yarn strands cross. Draw this directly toward yourself and then over the yellow strand. This is done with the thumb and fore-finger of the left hand. Next draw the original strand of the mane back, crossing the other mane strand at right angles, and lying over and parallel to the yellow strand of yarn. Draw snugly so as to keep plait close to the top of mane. When all has been drawn tightly, the yellow strand is drawn toward the body of the operator, then crossed over the strand of the mane which is parallel to the yellow yarn, and allowed to drop over the left side of the mane. The strands are held firmly with the left hand and the right hand is passed over to secure the strand of the red yarn, which is drawn directly toward the operator, crossing the yellow. Draw snugly, and keep left hand holding close in toward the top of the mane. Now draw the strand of mane which lies to the left of the strand of yarn to the right, causing it to cross the red strand. Hold firmly with the left hand, reach over with the right and gather up a small strand of mane from the top of the neck and draw in with the other, at the same time crowding the plait close in to the top of the neck. Hold firmly with the fore-finger of the left hand below the red yarn, thumb on top of the strands which cross it. Next draw the strand of mane which has been lying on the right, back toward the withers, crossing the other strand of mane, and thereby coming parallel to and above the

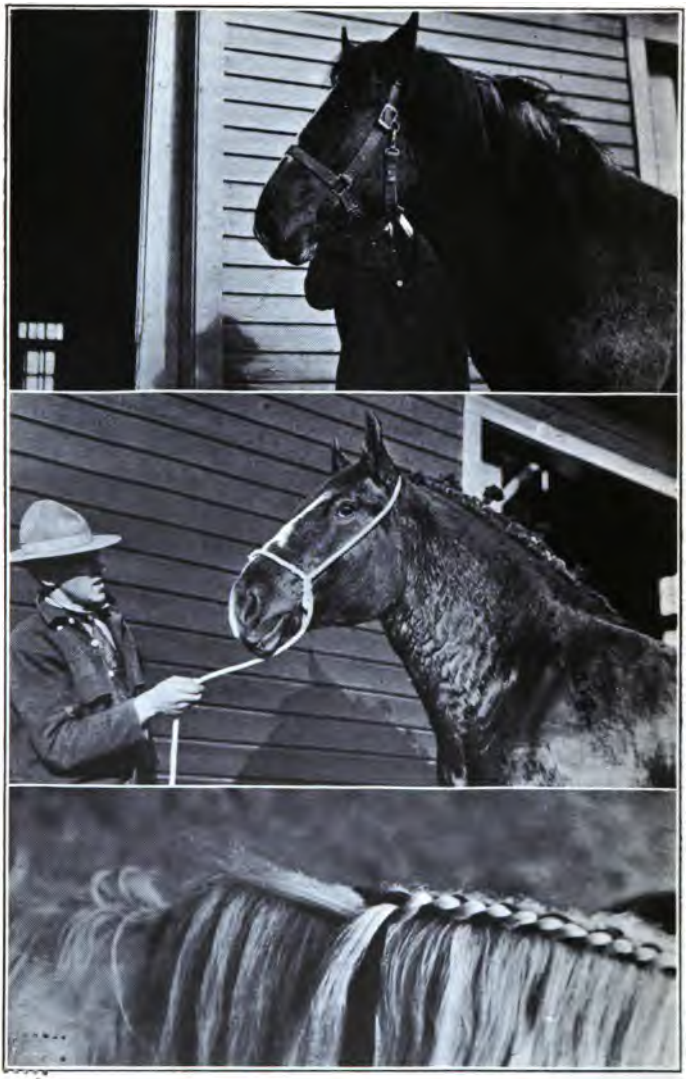


PLATE XV. — FITTING FOR SALE OR SHOW.

Above, in the rough before grooming or braiding; center, the same horse two hours later with Aberdeen plait and rosettes; below, Aberdeen plait partially completed.

red. Place thumb on top of this, and draw the red yarn slightly to the right, and then throw over to the left, clear over the neck. Then draw the yellow toward the operator, crossing the red yarn, and continue as before. Special care must be exercised to keep the strands of the mane of approximately the same size as the strands of the yarn. Fresh mane should be taken each time as the main strand is drawn in from the left and the plait is kept close in beside the top of the mane until well down toward the withers, where it should be gradually sloped down from the top, giving it a graceful curve. Hairs must be kept out of the yarn, as the beauty of the Aberdeen plait depends largely on the skill with which it is put in. Artificial roses may be used in this plait and it may be further decorated by the use of ribbon streamers. It is not customary to use the latter except in the larger shows, and when showing for championship, or other shows of similar nature. (See Plate XV.)

The French tie, or as it is sometimes termed, mud tie, is a quick and easy way of tying the tail in muddy weather, and is often resorted to in sale horses. The tail is first combed out with a mane comb. The operator then catches hold at the end of the tail bone, and separates the long hair into three portions. The center portion is pushed forward, and the operator draws the portion in the right hand across that in the left, and proceeds with an ordinary three braid underhand. After braiding a few inches, he rolls the greater portion up on the tail bone, and wraps the end of the strands around the tail twice, then braids again and tucks the ends through the tail. This gives a neat secure tie. This may be further decorated by the use of yarn and roses and be made into an attractive tie.

A tail braid which is often used in sale stables and also in the show rings is made by tying a loop in a stout cord and then tossing the cord over the horse's croup and drawing the loop end down over the tail. Draw it far enough so that the loop hangs below the end of the tail bone. Braid an ordinary underhand three strand braid over this cord and tail by selecting small bunches of hair from the outside. This braid binds in and conceals the cord and most of the tail. After the operator has braided down to the end of the tail bone, all the hair is braided in, care being taken to leave the loose string out of the braid. When about six inches of tail remains to be braided, a small stout piece of the cord about eighteen inches long is braided in, and when the end is reached the cord is used to put a hitch on the braid. This braid is then tied back to the loop string, and the cord is pulled out, pulling the large braid up underneath the braid surrounding the tail where it is tied in position so that the ends will not work loose. This is often used in shipping horses, and the tail is covered with muslin so that it will not rub out and be unfit for show or sale purposes. For show purposes it is decorated with yarn and made into an attractive braid. For long-tailed horses in show, it is not customary to braid in the entire tail, but braid about eight inches, drawing the portion back and decorating, leaving the larger portion of the tail flowing and natural.

Another method that is often used in the show ring is that of fixing the tail with rye straw. Tough, clean straw about eighteen or twenty inches long is needed. Twenty or thirty individual straws are selected and placed side by side and the ends trimmed. The straws should be damp and very tough. Tie a plain knot in the band of the straw, leaving one end about five inches long and

the other thirteen to fifteen inches. Separate the long ends in three parts of equal size. Then place on the top of the tail and plait the long ends into the tail by using a small strand of hair with each strand of straw, and braiding the whole as a three plait underhand. Braid down in this manner for four or five inches, and discontinue braiding and break the lower ends of the straw up about six inches from the end. Now roll the braid from the lower portion of the tail up to the straw and bind all fast with some cord and ribbon. The hairs from the lower end of the tail referred to above should be braided into a common three plait and tied before the work with the straw starts. The end of the straw is spread out like an open fan and trimmed with a pair of shears. It is sometimes necessary to see this braid put in before it can be carried out, but it makes a very attractive tie when it is properly done.

The long hair which is usually found around the throat and ears of the horse should be trimmed or singed neatly. This will add much to the appearance of the head and neck, and the general refinement of the horse. If the mane is unusually heavy, it may be thinned by pulling rather than cutting. This is done by taking a heavy mane comb, and by taking a few hairs at a time it can be readily thinned, and left in uniform condition. All of these methods of trimming have the object not of creating something unusual, but making the horse present his best appearance.

GROOMING

A horse well groomed is pleasing to every one, but grooming is absolutely essential for the show ring. With show horses, the principles are the same as outlined in Chapter

XVIII, but even more care must be taken that absolutely all the dirt be removed and that the coat carry the gloss which results from the extensive use of the brush. The action of the hair brush tends to increase the secretion, and obtains a gloss which cannot be artificially produced. To remove the final dust from the hair a wool rag may be used. A few drops of sweet oil upon the rag will aid in the collection of the dust. Proper feeding will greatly aid in the grooming, as the horse cannot be groomed so that the hair looks well unless he is in good physical condition.

SHOW YARD METHODS AND CUSTOMS

Courtesy to the judges and officials should always be a watchword with the exhibitor. Many show-men make a practice of being disagreeable, and as a result are neither popular with the public, the exhibitors, nor any one connected with the show. If any matters are not agreeable, they should be taken up in a quiet respectful manner and with the proper authorities. In handling the entries for show, the customary method is to send to the secretary and obtain entry blanks which should be properly filled out according to directions and returned. At the larger shows, cards and numbers are furnished to the exhibitors, designating the age and class for the animal. These should be compared with the catalogue or the premium list and definite knowledge ascertained as to when the animals will show. By following a system of this kind, the animals can be in better condition to show at the proper time, and the exhibitor will not be caught with his stock not ready when the class is called. The age limits on horses are based usually from January first, so that with the young animals, it is especially important

that the colts be foaled early, as they will have more size, and therefore a better chance for winning.

COMMON TROUBLES

In the show circuit bruises will cause as much trouble as any other ailment. These will be caused by the horses being in strange quarters and kicking one another, or from the injuries received in the car. This necessitates that the animals be handled with the utmost care. They cannot be run loose in a car like market horses and be expected to win prizes at the larger shows. For common bruises, hot applications, together with pressure bandages closely applied, are successful in removing the swelling.

Filled joints and stocked legs are also common. Usually these come from lack of exercise and the best cure is preventative. Usually when a large number of horses are on the show ground, it is difficult to get the men to exercise them properly, and the horse that is accustomed to four or five miles a day will usually fill up in the legs unless they are walked out. If exercise will not remove the filling, they should be rubbed with the hands so that the blood circulation is increased. Applications of warm water and bandages will help. Some horse-men find a rather strong solution of salt water mixed with vinegar useful for this purpose.

Horses that are fed highly very often itch, and thus cause trouble for the show-man. This is often caused by the feed not being cooling in its general nature, and if such is the case, a more laxative feed in the nature of bran should be used in connection with a reduction of the highly carbohydrate feeds. Very often a thorough washing of the affected parts with tar soap followed by

thorough drying will effect some relief. If the trouble is due to mange, a small amount of some standard disinfectant added to the water will help.

Flies cause considerable worry to the show-man. The most satisfactory method of fighting them is to use light stable blankets upon the horses. These may be very effectively made by the use of light weight canvas or muslin. If it is not possible to use light weight blankets, it becomes imperative to employ some of the anti-fly preparations. Most of these, if applied in large quantities, will color the coat, especially on the lighter horses, and leave it sticky so that it will be hard to clean. Therefore, the better plan is to apply very lightly and often rather than to spray the horses thoroughly with it.

Colds, distemper, and influenza are difficulties that very often confront the show-men. In order to prevent them, care should be taken to prevent any drafts striking the horses. Very often such diseases are carried from an affected group of horses and spread to the others that are near by by the close association and use of the same water-pails. Hence it is necessary that the show-man provide himself with his own utensils and also that he be on the lookout for any trouble.

Horses on heavy feed are more liable to colics, indigestion, and founder. The preventative methods in this case are a close watch of the bowels. If a horse is constipated or shows an inclination to go off feed, he should receive immediate attention. The feed should be cut down and treatment prescribed according to the ailment. In troubles of this kind, a veterinarian should be called at once, as very little treatment at first will usually check such troubles, whereas they will take considerable treatment and probable loss if allowed to develop.

SHIPPING HORSES

In shipping horses, there are three standard cars used; the palace horse car, the common box car, and common stock car. If any large amount of shipping is to be done, the first is preferable, as it provides stalls where the horses may be kept separate, and also may be fed more conveniently. They usually will prove a good investment if obtainable. Box or stock cars should be subdivided by proper stalls, so that the horses will not have opportunity to fight. In shipping market horses, it is customary to use open stock cars and to bed heavily with hay, so that the horses may eat some of it if they so desire. This will in some measure offset the shrink. The hay racks should also be well filled.

The watering and feeding of show horses especially should be looked after, as it is hard to put good bellies on the horses if they are allowed to shrink to any extent. Horses cut up in the flank are not good show prospects. The same will hold true for stock that is offered for sale. Railroads are required to feed and water at least every twenty-eight hours, but it is advisable to cut this time shorter if possible.

The cars should be ordered some time ahead so there will be no excuse for the agent not having them spotted and on hand at the time required. Railroads handle the situation better than they did in the past, but even yet require some attention. In many show circuits a refund is granted for show horses. It is well to inquire in regard to this before shipping so that proper authorization may be made for any refund if this is obtainable.

MARKETING

The common market for most stockmen is the local horse buyer. This local horse buyer usually spots horses for the larger buyers who come through the country at certain periods. When such a system is in use, and especially if there is any competition, a fair price is usually paid the farmer. These men want the horses in good flesh so that they are ready to ship to the central markets. In some sections, coöperative horse marketing is meeting some favor. By this method the men who have some horses to market go in together and make up a car-load and send to the larger city horse markets. When handled in this way they are consigned to some commission man who handles the selling end of the proposition. When it is not possible to get in touch with buyers from the outside, usually a local buyer can be obtained by presenting the horses at local shows and otherwise advertising that they are for sale. The European governments buy war horses only at the central markets, but scattered through the country are local buyers who usually operate for some of the larger firms that are established in the central markets. It is seldom that any war horses are sold by the producer direct to the foreign governments, but in common practice, they are handled very much as other market horses and change hands several times before reaching the consumer.

CHAPTER XXV

JACKS, JENNETS, AND MULES

THE mule is a hybrid produced from the breeding of jacks to mares. On account of these being of two distinct species, the hybrid will not reproduce, and therefore the mule must be considered as merely a machine for the production of work. Even though mules will not reproduce, it is necessary to castrate the males as with horses, or they are unsatisfactory for work. The public does not regard the mule with as high respect as the horse, probably because it does not have the style, carriage, spirit, and beauty which is found in the better specimens of horses, and also because his sire has long been considered the emblem of stupidity.

Even though the mule is a hybrid, his parents must be properly bred and developed in order that he have good size and conformation. The idea that any mare which is not good enough to raise a horse will raise a good mule has been found not to be true. The better class of mules come from the better class of mares. The small pony jacks likewise do not produce large mules, but it requires a rugged type of jack in order to produce a mule with good bone and constitution. The extremely long-legged, and light-boned jack, or the extremely large, rough mare, is not suitable for mule production, as the mule so produced is too leggy and lacks bone and constitution.

ADVANTAGES AND DISADVANTAGES OF MULES

The principal advantages of mules as compared to horses are as follows: They are somewhat more hardy and possess more endurance than horses, at least under certain conditions; they are surer footed and for this reason are more in demand as pack animals in the mountains, and for climbing up and down grades and embankments as in all forms of railroad and contract work; they have a better sense of self-protection and are thus more satisfactory for use with unskilled labor; they are somewhat easier to feed in large bunches as on large plantations and ranches and large contracting jobs, and they seldom overeat if given too much; they are commonly considered more tough and wiry than horses and more resistant to diseases, and on this account will stand more hard work and abuse than will horses. Since mules are entirely for commercial purposes and since they have few disqualifying defects, their market value is much more stable than with horses. On the other hand, there are some well-defined disadvantages to the raising of mules which may be given as follows: they will not reproduce, hence their total value must be measured in terms of work; mules lack the style and attractiveness possessed by a well-bred horse; they do not have the gaits or speed for fine driving or saddle purposes; and they do not have the weight and muscle for very heavy pulling. Many persons will argue that for the amount of work performed, a mule will require less feed than a horse, but this has been found by experiments to be a fallacy. In common labor, the horse will accomplish just about as much for each 100 pounds of weight as will a mule, and the feed requirements for horses and mules for each 100 pounds live weight are practically equal.

FEEDING OF MULES

The main difference in feeding mules as compared to horses is that they do better in large bunches. In fattening mules it is very seldom that they are stall-fed, but are usually run in bunches in small lots and all fed together like cattle. Mules will seldom over-eat or injure one another as would horses under like conditions. If not properly watered and fed, they will have colic and other diseases the same as horses. Usually, however, they seem to have a better sense of self-protection and use better judgment in regard to their eating. Mules, however, respond to careful attention and care the same as horses.

HANDLING OF JACKS

The average mule-producer does not own jennets, but only a jack which he has purchased from some breeder of jacks and jennets. The jacks should be properly trained to breed and serve mares before they are sold. If they are produced on the farm, care should be taken that they are not raised with the jennets, but are separated and raised with horses. They should also not be allowed to serve jennets, as very often they will refuse to cover mares after mating with jennets. The equipment for handling the jack is very similar to that of handling the stallion except that a pit is needed to lower the mare. The main difference in handling is that the jack is usually more slow in the service. One way of partly overcoming this is to have a slatted door on his stall which faces on the breeding lot, so that the jack may see the mare some time before he is taken out of the stable. Under such management he will generally be of quicker service than otherwise. Care should always be

taken that no undue cruelty is used with the jacks, as they are often timid and therefore must be encouraged rather than discouraged.

In the handling of jacks with jennets the problem is simpler, and usually no trouble will be encountered. Occasionally jacks will be found that will breed both mares and jennets, but such is not commonly the case. When such practice is followed, the mares are bred in the early season with the jennets, waiting until after the main part of the mare season is over.

MARKET REQUIREMENTS

The type of jacks and jennets demanded in America at the present time is best defined as an American type. This type has been developed by the use of jacks and jennets from several different countries, but under the direction of breeders located largely in Kentucky, Tennessee, and Missouri. These jacks have developed into a larger type than the imported ones and are usually termed Mammoth jacks. The main requirements for a good breeding jack are large bone, large heart girth, strongly coupled back and ribs, a large head and large ears. The finer jacks will not produce as large a mule, and therefore are not to be desired. The general type of jennet is similar to that of the jack, except that she is naturally smaller. Many jacks are found throughout the country that are nothing more than large burros and are not desired by the breeders.

HINNEY PRODUCTION

The hinney is produced by the opposite cross from the mule; that is, by breeding a stallion and a jennet.

Usually this cross is harder to obtain than the cross producing the mule, as the stallion usually refuses to breed jennets. This necessitates that the larger number be produced by artificial impregnation, or by a stallion that has been raised in company with the jennets, and not allowed to serve mares. Because jennets are smaller than mares, it has been argued by many that the cost of keep is correspondingly less and therefore the hinney is a more profitable market animal than the mule, as the feed for the jennet costs less than for the mare. One difficulty with the enterprise is that good jennets are not used for the production of hinnies but for the production of jacks, and therefore the smaller and pony-like jennets are the ones used for hinney production. This results in a small type of animals of low marketable value. The other difficulty is in the management, on account of the use of artificial impregnation or the care which must be taken with the stallion. It is probable that hinney production will be increased to some extent in the future, but it is extremely doubtful whether it will ever become large enough to produce any noticeable effect on the market situation.

PART V

SWINE

By George R. Samson

CHAPTER XXVI

BEGINNER'S PROBLEMS

THE most rapidly growing live-stock industry of the West is that of raising hogs, although even yet hog-raising does not assume the proportions it does in the Corn-Belt or with other lines of live-stock in the West. The hog is essentially a grain-eating animal and is grown in large numbers only where there is abundant grain of not too high a price. The West has more grass land than grain land, and where grain is grown, it is wheat, barley, or oats, instead of corn, and therefore usually has a higher market value than corn, although the feeding value a pound is not much different. It has been demonstrated, however, that by proper use of pastures and other supplemental feed, the cost can be made lower than was popularly supposed. In addition, there are great quantities of waste material in the grain fields of the West and equally large quantities of by-products from the dairies, all of which may be utilized for pig feeding so that a good profit may be realized, even when the grain fed does not in itself any more than return its cost. About the year 1910 the farmers of the West began to take a great interest in hogs. Prices were abnormally high and the numbers of hogs increased enormously. Western markets that had been procuring

most of their live hogs from the Corn-Belt ceased shipping from there within three or four years. The Portland market shipped 33,789 hogs from Nebraska in 1911, but none since 1912. In 1910, Portland received 25,559 hogs from Oregon and in 1915, 202,804. Similar conditions were found in other parts of the West. Necessarily many mistakes were made and many disappointments met, but the business is now on a permanent and substantial basis. Those farmers who use some waste products in raising their hogs find that the business is profitable even with high-priced grain. On the other hand, farms devoted to raising hogs exclusively, excepting high-class breeding farms, have rarely been successful. The most successful pork-producers are those who raise a few pigs in connection with dairying, grain farming, or orcharding. These men all feed considerable quantities of threshed grain, and the pigs actually obtain most of their nutrients from the grain, although the profit is largely from the waste products.

LOCALITY

The locality suitable for hog-raising must be one that produces an abundance of grain, more than is necessary for local use; that produces good legumes, as alfalfa and clover; and that is not cut up into small tracts at an excessively high value an acre. Distance from market will also be a factor, but since hogs can be shipped or hauled almost as cheaply as grain, a long distance from market may not be a serious handicap. The important item in the adaptability of any locality for hog-raising is whether it produces suitable feed at prices which will justify its use for pork production.

THE FARM

Having considered the locality, it is well to ask a few questions regarding the farm itself: Are the farm products suitable for hog feeding? Is the land sufficiently well drained to permit hogs running on pasture during the greater part of the year? Is there abundant shade, or will artificial shade be necessary? Does the overflow from adjoining farms run over the place and thus increase the danger of infection? Are there many other hog-men in the vicinity? If so, are they careless about the spread of disease? Have they given the community a reputation for producing good stock, or do the buyers look askance at everything coming from that source?

If the farm is to be devoted largely to hogs, the greater part of its area should be capable of producing the staple cereals and one or more legumes. If cows are kept for dairy purposes, it should be determined whether the skim-milk or other by-products will be utilized more economically by pigs or by calves. About one pig to a cow may be maintained if half the calves are raised, but if all the calves are to be raised, a smaller number of pigs must be kept. In general, one may safely count on one pig to each seven pounds of milk available daily. If dairying is followed only part of the year, the time the pigs are on hand must be adjusted to the supply of milk.

Swine are particularly adapted to dairy farms where the skim-milk can help fill in the gap between the weaning and fattening period. With the exception of high-grade dairy heifer calves, pigs will pay a better price for skim-milk than any other class of stock. In fact, under most good systems of farming, pigs and dairy cows on the same farm will pay better than either one

or the other raised exclusively. The exception to this rule is found in localities where milk condensers have been developed so that there are few by-products of the dairy business which can be utilized in pig feeding.

Swine fattening differs from cattle fattening in that it is conducted largely on the farm where the hogs were raised, while in the case of cattle, the fattening process is often carried on at a long distance from the farms and ranges on which the cattle were grown. In the West the practice of fattening hogs after beef cattle is unknown, since hay-fed cattle contribute nothing to pigs through their droppings, and grain feeding is not practiced here as in the Corn-Belt. Hence, hogs and beef cattle do not supplement each other as do hogs and dairy cattle. Many farms in the Willamette Valley carry both hogs and sheep, but there is little relation between the two lines of industry and neither of them contributes anything material to the other. Hogs are also rapidly making a place for themselves on the large grain farms of the West, for they fit in well with the common systems of farming and they utilize the down grain and the waste of the threshing yards.

MARKET CONDITIONS

The time to sell pigs is when the price is good and not many are on the market. Portland market reports for the few years the market has been established, reveal the fact that there are certain high spots and low spots recurring each year at approximately the same time. When the supply goes down, the price goes up, and vice versa. This rule is not without exception but it holds in a greater number of cases. The packer demands the largest number of hogs during the months of Novem-

ber, December, and January as this is the packing season, but even then the demand during these months is usually somewhat over-supplied, at least in the West. The western farmers market about one-half of their year's production of hogs during these three months, while the eastern farmers do not market over one-third of their hogs at this time. This makes it imperative that if one is to realize highest price, the periods of heavy supply must be avoided.

When the by-products available for feeding come at a particular time of the year, and then are gone, the pigs must be at a suitable size to consume these by-products to the best advantage when they are available; but when the by-products are rather evenly distributed, it is necessary that some pigs of suitable size be available through the year. In the great grain-growing sections of the West the chief by-product is the shattered grain on the stubble fields; and since this must be used quickly after harvest, and since the pigs which make the most profitable use of this by-product are individuals weighing from 75 to 125 pounds, it follows that within a few weeks after this period a large number of pigs will be sent to market from these localities. Fat pigs are a perishable product; that is, they must be marketed very soon after they are finished, regardless of price or other conditions. Hence it is necessary to plan for their disposal a long time before the pigs are ready for marketing, in fact before the sows are bred.

FLUCTUATIONS

Pigs are subject to wider and more rapid fluctuation in prices than any other class of live-stock. This is because they increase so rapidly that a shortage may

change to a surplus in two or three years' time. When for any reason pigs are high in price a great many persons are attracted to the business; accordingly they rush in, buy large numbers, and thus increase the price, through absorbing stock that would otherwise go to the market. In about a year's time they have surplus stock to put on the market, thus causing a decline in the price. They then become discouraged because of the low price, and sell out not only their surplus but their original breeding animals. Much of this stock is not suited to market requirements and tends further to demoralize the market until those who have been in the business in a legitimate, conservative way also suffer. These rapid changes are facilitated by the fact that the feed used for hogs may be readily put to other uses, while the cattle-man or sheep-man must keep some stock to consume the grass.

A better method is to buy only on a small scale at the start, and gradually build up a herd. This avoids the necessity of tying up a large amount of capital at the beginning, besides decreasing the danger of an over-supply and the consequent lower price. The beginner will learn as much about raising pigs as if he had a much larger number, and is not likely to lose so many. Usually a good time to buy is when the price is poor and the market over-supplied. Choice stock can then be bought at a low price and if young stock is purchased which will not bring a crop of pigs too quickly, the market has time to change before the increase is ready for market.

NUMBER OF PIGS FOR THE FARM

A sufficient number of pigs should be kept to consume the by-products which are suitable for pig-feed, with only enough of the expensive concentrated feeds to

fatten the pigs sufficiently for market. By the term by-products, is meant such products of the farm as cannot be marketed in their present form. Grain shattered in the stubble fields, melons and pumpkins which have been found unsalable and left in the field, the aftermath of clover, skim-milk, cracklings, and table refuse all have a place in the pig's diet, and can be marketed through the pigs more profitably than through any other kind of stock. Too few pigs will not use all the waste of the farm while too many will require an excessive amount of high-priced grain. A good rule, but one subject to many exceptions, is to raise one pig for each dairy cow on the dairy farms and one pig to each five to ten acres of grain on the grain farms. If this rule were universally followed, the western markets would be liberally supplied with pork and every pig, not mismanaged, would return a profit.

CHAPTER XXVII

EQUIPMENT

THE equipment required for hogs is not necessarily expensive but it comprises numerous combinations for the comfort of the animals and the convenience of the attendant. Much ingenuity may be exercised in designing equipment especially suitable to individual conditions. It is very easy, however, to spend more money than is at all necessary or profitable.

HOUSES

Pig houses are of two general classes: colony houses designed to shelter a single sow and her litter, and centralized houses, designed to shelter a larger number of pigs or sows. Neither has all the advantages, and both kinds are often successfully used on the same farm where more than one or two sows are kept. The colony houses are economical in first cost, portable, easily kept clean and sanitary, but they entail a greater amount of labor and the labor must be performed, in part at least, in the open and exposed to the weather, while the centralized house affords shelter to the attendant. The colony houses are designed according to a wide variety of plans, but the A-shaped, open-front house has been found most desirable for the milder sections of the country. In colder localities, a warmer house, that is, one with a closed front, is desirable.

Because they require no glass and lighter framing, the colony houses are the less expensive in first cost.

With the centralized house, the danger of disease spreading through the herd is greater, once it enters, than when colony houses are used. It should, therefore, be planned with sanitation and easy disinfection constantly in mind. Sanitation involves light, ventilation, cleanliness, and pure-water supply.

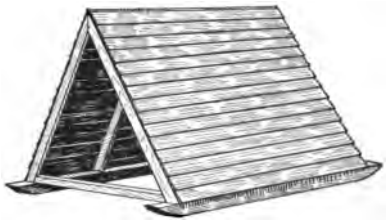


FIG. 33. — Typical "A" Hog House.

The method of ventilation depends on the climate. If the climate is severe, greater precaution will be necessary in admitting fresh air and permitting the exit of the stale air, while if the temperature is habitually higher, very little system is necessary in securing good ventilation. A hollow shaft leading from the floor through the roof will permit the exit of stale air from the bottom; and an intake under the eaves with a shaft opening just under the comb will admit fresh air from the top, which will minimize the draft on the pigs. Light may be secured by open space or by glass, depending on the climate. Since glass is expensive, it should be on the south side of the building, so that morning, noon, and afternoon rays all reach some part of the pig house where sunshine is needed. Any equipment used constantly is less expensive from the standpoint of results obtained than the same equipment used only a part of the time, and therefore greater expense is justified in case the glass is in the south where it is used constantly. A plan with this end in view has been worked out by

Dietrich at the Illinois Experiment Station as described in Illinois Bulletin 109. This house has been in operation for eleven years and has been found quite satisfactory. The vital principle of this house is the location of the windows so that the maximum sunlight will reach the pens during the time of the year when the pigs are farrowed, while in midsummer when the sun is high, it is shut out by the projection of the roof. The centralized house should not be too close to other buildings and it should be located on ground that will produce pastures suitable for hogs during the greatest part of the year. A number of plans for providing a separate pasture for each compartment of the centralized house have been worked out, but the expense of fencing and the difficulty of cultivating small fields usually make them impractical. For this reason it is considered better to provide fewer but larger pastures and have four or five compartments open into each.

GRANARY

As a part of the centralized pig house, or in close proximity to it, should be a granary large enough to contain sufficient grain and other feed to last through the feeding period. It is especially desirable to have all of the feed close enough to the pigs that it need not be hauled during muddy weather. The granary should have a sufficient number of compartments to contain as many mixtures as are likely to be used at any one time during the year. In addition, there should be a mixing floor. Convenient to this, but not too close, should be a water supply.

A sufficient amount of grain room should be allowed to each sow, to contain seven pounds of feed for each day she is to be fed in the building. If it is desirable to store

feed to last five months, or 150 days, this would necessitate the storage of 1050 pounds of feed for each sow. If pigs are also to be fattened from the same supply, about 700 or 800 pounds should be allowed for each pig. A safe average would be about 124 cubic feet of bin room for each farrowing pen, or if the herd is to be fed from the central house the entire year, double this amount. The mixing floor should be five or six feet each way and should preferably open into the alley so that there will be room for manipulating the shovel handle without needing to leave special space for this.

If a large quantity of ground grain is mixed and stored for a considerable period of time, there is danger of it spoiling, so that in case a large plant is being installed, it is safer to have the grinder in the same building with the feed, and only grind small portions of feed at a time. In most cases, however, if the feed is stored very dry and the building is watertight, there will be but little difficulty from having grain spoil, and the plant on the average farm will not usually be large enough to justify the installation of a grinder and power plant solely to grind hog-feed.

The power is the greatest expense and when the farm already has an engine or other power, the grinder will cost very little. A good burr grinder suitable for general farm use will cost from $25.00 to $50.00 and will take five to ten horse power. A roller grinder will cost $100.00 to $150.00, but there are no burrs to wear out so that when any large quantities of grain are to be ground, the final cost of grinding a bushel of grain will be less than with the burr mills. The roller mill, if used, must have corrugated rollers and be equipped with a differential so as to grind as well as roll. Pigs require that the grain be ground

very fine and this should be kept in mind in selecting a grinder, since there are many grinders on the market which will not grind fine enough for pig feeding.

WATER SUPPLY

Pigs drink a large amount of water, from twelve to twenty pounds to the pig each day for mature hogs; hence a good watering system is very desirable. On most western farms, a waterworks system can be installed with so little difficulty that not only for the convenience of the pigs, but for the general improvement of the farm it should be put in as soon as possible.

WATERING DEVICES

Since hogs require water at frequent intervals, it is desirable that a system be established which will reduce the labor of watering to the minimum. It seems justifiable to go to greater expense in putting in an efficient water system than in almost any other item of the pig equipment. So far as possible, fields which are to be used as pig pastures and which are not provided with springs or natural streams should be supplied with pipes running from a central water system. If this expense cannot be entailed, a suitable device may be made of a large barrel with an automatic watering equipment attached. This will supply water for 1000 pounds of pigs for four days, provided none is wasted. The labor of refilling the barrel if the water has to be hauled adds a considerable expense. A suitable device if water is piped to the pastures or pens may be made with a float valve, the float being boxed in at one end of the trough so that the pigs cannot break it to pieces, and if the troughs are on the same level, one trap can regulate several troughs. (See Plate XVI.)

PLATE XVI. — HOG FARM CONVENIENCES.

Above, left, Oregon breeding crate; above, right, trimming a boar's tusks; below, left, hitch for holding large hogs; below, right, automatic hog waterer attached to a barrel.

TROUGHS

With reference to the initial cost, the cheapest troughs are made of wood, oak being the most durable and fir the least. The fir, however, is by far the cheapest in the first cost. If troughs are made of wood, the shape may be either flat-bottomed or V-shaped. The flat-bottomed troughs are preferable for sows with small pigs, and for all pigs on dry feed. The V-shaped troughs are

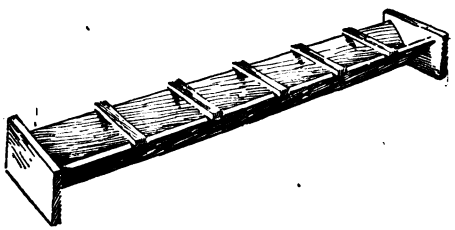


FIG. 34. — The Most Common Type of Hog Trough.

preferable for feeding slop or wet feed and when small pigs are not to be fed with their dams. V-shaped troughs are too high to permit of small pigs eating from them with ease and they will not begin eating so soon. On the other hand, the flat troughs are harder for pigs to clean and more waste results from their use. Cement as a trough material has not been tried out on any large scale, but is entirely satisfactory if a system of flushing can be used. It is impossible to turn the troughs, hence a drain must be provided. A slatted door or lid, hinged at one side of the trough, may be raised and hooked when troughs are to be cleaned. Iron troughs are highly satisfactory, except for the initial cost, which is almost prohibitive. They may be of any shape, but they are usually made with an oval bottom.

FENCES

For inside fences or partitions, heavy woven wire with a close mesh has been tried out and found fairly satisfactory. It admits the light freely, permits the hogs to see each other and the attendant, and it is easily cleaned and kept sanitary. Wooden partitions must be tight, otherwise the pigs will gnaw through them or try to climb over them. They would better be made movable, so that, if desired, two or more pens may be combined. This may be done by means of two cleats nailed to the underside of a two by four placed at the height which the partition should be. One of these cleats is nailed in temporarily after the ends of the boards have been set up against the opposite cleat, and when the partition is to be removed, the nails are drawn from the temporary cleat and as many boards as desired taken out. Worn-out boards may be replaced in the same manner. Concrete fences have been suggested and used to a slight extent, but more as a base for iron fences: that is, a wall of concrete a foot or eighteen inches in height is used on which to set the iron fence. This prevents the manure passing from one pen to another and makes quarantine more easily possible. As an entire fence, concrete takes up too much space and is too expensive. For outside fences, no material is more serviceable or convenient than woven wire. The material of which the fence is made should be as heavy as can be secured, since the very heaviest and closest mesh fence obtainable will be none too good. The regulation hog fence is made of No. 9 wire throughout. Very little of this fence is sold in the West, but its extra durability will justify securing it even with the additional expense involved. The stays should be six inches apart instead of twelve as

is usually the case. In general, the fence should be stretched tightly to posts sixteen feet apart, but when fencing small lots, the posts should be only eight feet apart. Around the small lots, it is convenient to have a two by four laid flatwise on top of the posts. This serves to brace the posts, to keep the wire from sagging down between them, and adds a finished appearance to the fence. The fence should be securely attached at the bottom, and heavy barb wire stretched tightly on the ground below the bottom wire of the woven fence. Many fences are provided with a barb wire woven in as the bottom strand of the fence, but this has no advantage, and the fence is less convenient to handle.

FLOORS

The durability and ease of disinfection are the chief advantages of concrete, but when only a small number of pigs is kept, or when the floors are later to be replaced by better ones, wooden floors are satisfactory, and will last three or four years. The floors of the inside pens usually slope toward the drain if a drain is provided. Whether the floor should be provided with a drain will depend on the system which is in use on the farm for handling the manure. Just as with other kinds of stock, there are two general systems for handling manure; one method is to absorb the liquid with bedding and remove at frequent enough intervals to keep the house sanitary. The other method is to lay the floor in such a manner that the liquid will not reach the bedding and will run off from the pen either into a drain or cistern. There is more difficulty in keeping the piggery bedded down than is experienced with other kinds of stock, because

of the pig's habit of rooting. If pigs have the opportunity, that is, if their pen is built in such a manner as to permit it, they will keep themselves and their beds clean, so there is usually provided some sort of device which will shut off the bedding quarters from the dung quarters. The

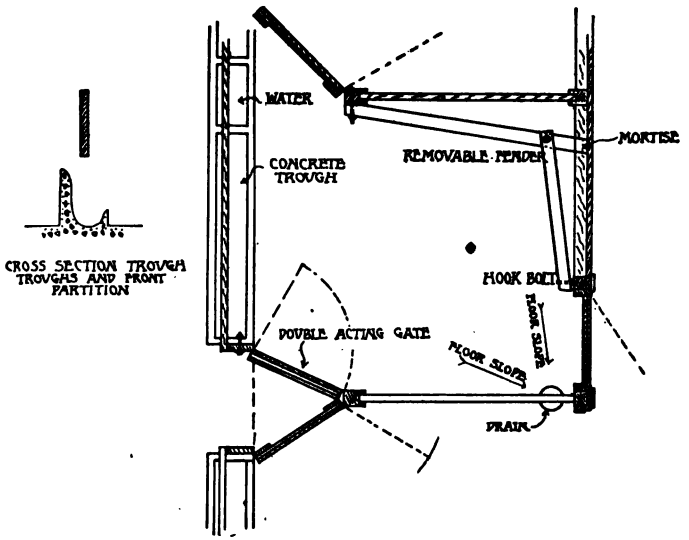


FIG. 35. — Typical Pen of the Oregon Hog Barn.

bed may be placed on a platform raised from two to six inches above the remainder of the pen, and the remaining portion built according to either of the previously suggested methods. On the other hand, the entire pen may slope towards the outside door or towards the drain, and no special precaution taken to keep the bedding out of the manure. (See Fig. 35.)

The advantages for concrete are durability and sanitation. The disadvantages are the expense involved and

the coldness of the material. As sometimes constructed, they are also slippery, but this need not be the case, as a rough finish will obviate this difficulty. The coldness may be avoided either by the liberal use of bedding or by an overlay, which consists of a board platform laid over that part of the cement floor on which the pigs are to lie and the bedding placed on top of this. In summer, of course, this platform should be removed and the pigs allowed to lie on the cool floor. Some persons have recommended two layers of coal tar between the grouting and surface layers of cement. In winter, moisture sometimes accumulates under the platform, so that it will need to be moved from time to time, but if the dust is kept from beneath it, very little dampness will accumulate. Those who have used concrete floors differ in their judgment on them. Some maintain that the pigs warm the concrete floor through their bedding, and the floors remain warm, provided they are dry. On the other hand, others maintain that the floors are always cold and clammy, and must make the pigs uncomfortable. Undoubtedly the drainage and ventilation of the building have much to do with the condition of the concrete floor. If the ventilation is not good, more moisture will accumulate on the floors; and if drainage is poor, they will likewise be damp. If ventilation and drainage are good, however, keeping the floors dry is a much easier problem, especially if the floors are thoroughly water-proof, which will not be the case unless the concrete is made from the correct mixture and properly tamped.

DIPPING VAT

In order to keep pigs free from external vermin and occasional attacks of mange, some system of dipping is

desirable. On farms where sheep as well as pigs are kept, the dipping vat is ordinarily already installed, but where sheep are not kept and only a small number of pigs are raised, it may be considered too expensive to install a dipping vat. In the latter case a hole may be dug in the ground and water poured into it and the sheep dip or crude oil added to it. The pigs are then allowed to wallow in it at their pleasure, and in hot weather they will keep themselves free from vermin. The difficulty with this method is that the wallow will soon become foul, and if sows which are suckling pigs are allowed to run into it they daub themselves with mud so that the little pigs get the mud into their stomachs, causing some losses. This difficulty may be largely obviated by lining the hole with planks, or in other words, building a box of suitable size and embedding it in the earth, allowing the edges to extend slightly above the level of the ground. If the sides are high enough to avoid splashing the water over, a mud-hole can be avoided. The wallowing vat should be embedded more deeply in the ground at one side than at the other, so that pigs may lie in the water at different depths as they desire, and so that they can get in and out of the vat without difficulty. Wallowing vats of concrete are often used and they are very satisfactory and not particularly expensive.

Rubbing posts, consisting of bagging or some other absorbent material tightly bound around posts, located conveniently for the pigs to rub on them and saturated with crude oil, have been recommended as a means for keeping pigs free from vermin, but the results have not been entirely satisfactory. There are too many other posts which are convenient for the pigs to rub on, and they do not use the oiled posts enough. Various devices

are recommended as efficient lice-killers, but the expense which they entail is ordinarily too great in comparison with that of a regular dipping vat. A dipping vat for pigs is constructed in the same manner as those for sheep already described except that for large hogs the vat must not be less than twenty-six inches wide at the top. Other dimensions may be the same.

MISCELLANEOUS EQUIPMENT

Under this heading will be considered such instruments and implements as are useful and necessary in connection with the pig business, but which cannot properly be spoken of as fixtures on the place. If pastures are used the pigs must be ringed. A small pair of pinchers for applying the rings may be procured for fifteen cents and will last a long time. The rings cost about ten cents a box. The fish-hook rings are most generally used, but plain rings are sometimes necessary, and both should be provided.

An ear-punch similar to that used for cattle or sheep is useful, if pigs are to be ear-marked; that is, notches placed in their ears.

A castration knife with a straight edge blade and made of the best steel is very essential. Such a blade is sometimes found on the ordinary pocket knife, but in such cases the blade usually requires extra attention before any operation is to be performed.

If the pig house is to be kept disinfected and free from vermin, a spray is needed and may be provided with small expense. Such a device is worth having if the house has been built in such a manner as to make disinfection practicable.

A hog-holder, for ringing pigs or for holding them for

any other purpose, may be made similar to a twitch for horses. A simpler device consists simply of a small hard rope with a running loop like a lariat which may be placed about the pig's upper jaw just back of his incisor teeth, and the loop drawn tight. The pig pulls back on the rope in an attempt to get away, and may be easily held. Another hog-holder is made of iron about the size of a wagon rod and provided with a loop bent on either end

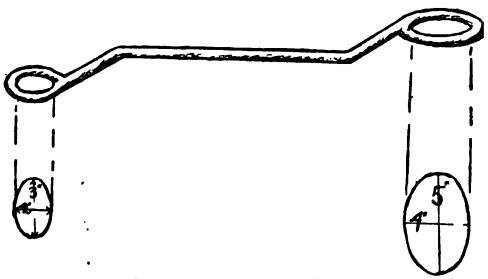


FIG. 36. — Hog Holder.

as shown in Fig. 36. One of the loops is for large hogs, and one for small ones, the opposite end in either case being used as a handle. A man single handed can hold and ring a bunch of pigs with either of these implements, while without one of them, two men would be necessary. Even large hogs may be snubbed up with a rope and the rope tied about a post, making it possible for one man to handle them.

A loading chute with a pair of wheels so it can be moved easily is a great convenience. The sides of the chute should be biased and the angle adjusted to the height of the wagon which is ordinarily used for hauling hogs. The bottom of the chute can be rested on the bottom of the wagon box and held in place with a hook and eye.

CHAPTER XXVIII

THE BREEDING HERD

THE secret of successful pig raising lies in the handling of the breeding herd; and the profit or loss of the season's work is very largely determined before the pigs are born. A fattening pig that is improperly fed or managed at once retaliates by ceasing to gain, and the attendant is thereby warned to change his methods. But a boar or brood sow improperly handled may apparently thrive and yet some weeks or months later pay the debt with heavy interest. It is necessary that this matter receive most careful attention.

THE BOAR

It is best, when possible, to secure a tried breeder; that is, one which has sired pigs. Such boars have generally been used until the owner, because of having gilts sired by the boar, or for some other reason must let him go. The opportunities to secure such animals, however, are not very frequent, and it is usually necessary to resort to a young untried pig. If possible, one should visit the farm from which it is proposed to secure the animal before making any definite contract. This will give an opportunity to see the way the animals have been kept and to find out the particulars which could not be learned by mail. The following points should be kept in mind when

selecting a boar: First, that the animal is of good market type; second, that he has masculinity well defined; third, that he is in good condition as compared with the other pigs kept in the same lot with him, or kept in like manner as himself; fourth, that he is out of a large litter from a sow that is a good mother; fifth, that the boar is pure-bred, and his pedigree or transfer certificate should be received with him, or if the owner has not these papers a part of the purchase price should be held until he turns them over to you.

One should not buy a grade boar, or one which the owner says is of pure blood, but on which the registration papers have not been kept up. If such a boar is found to be an exceptionally good breeder and the new owner wants to pass him on to some one else, the next person will be sure to insist on the papers. A runt from a good herd should not be purchased merely because he is cheap. One should not buy a boar of one breed when his sows are pure-bred and of some other breed, nor should a pig under five months of age be purchased for immediate service. When the boar has been secured, one should not turn him out in a lot with strange hogs, because there may be brood sows in heat, and other hogs may fight him. Over six sows should not be bred a week, nor more than two in one day with a boar under a year, and over eight a week with a mature boar.

A boar six months old can get pigs, but a boar should not be used until he is eight months old, and but sparingly at that age. The way the young boar is used has a great deal to do with his length of life and his utility. If desirable to try him out, it may be done with only a small number of sows, and then his usefulness will not be impaired. Many breeders waste much money by procuring

a new boar every year. Allowing a boar to do service, takes a considerable amount from his value as a market animal, and most boars are sent to the butcher before the owner finds out whether or not they have proven profitable breeders. A much better way of handling the boar is to keep him for several years, and if no new sows are added from his produce, there is little chance of making a mistake in retaining him. He is not worth much for meat, and another year of service will take but little value from his carcass when he is killed. When a good boar is obtained, he should be used as long as possible, and then passed on to some one else. A mature boar will get larger and stronger pigs, and more of them from the same sows than will a younger boar.

The feed of the boar should not be materially changed when he is taken to his new home. If any changes are to be made, they are to be made gradually. If he is in good growing condition, keep him so, but do not endeavor to make him excessively fat. On the other hand, if he has been kept up in show condition, and it is not necessary to use him for breeding purposes immediately, it is not a bad policy to reduce his flesh somewhat, and then a month before he is to be used, begin to make him pick up again. As a rule, however, it is not necessary to remove the flesh of the boar unless he is very large or old.

DRY SOWS

Sows from which pigs have been weaned usually come in heat three days after the pigs are removed and if it is desired to produce a second litter that year, the sow should be bred at that time. However, if she is in thin flesh, it may be best to allow her to pass one or two periods and

breed her later. After sows are bred, if they are in reasonably good flesh, they may be turned to good pasture where they will maintain their weight without any grain feed. However, if the sows are thin in flesh, or are not good grazers or if pastures are poor, they must have enough grain to provide for a slight increase in weight during the gestation period and thus regain the flesh lost while suckling the pigs.

GESTATION PERIOD

The gestation period of pigs is usually 112 to 115 days. Vigorous sows generally come within these limits. Immature and old broken-down sows ordinarily farrow in a shorter time than the vigorous ones. The weight of the pigs is usually larger with those sows which have the smallest litters, and which have the longest gestation period. It will require six or seven months to grow the pigs from birth until they are ready for market. Hence, it is ten or eleven months from the time the sow is bred until the pigs are fat. As has already been intimated, there is likely to be a comparatively weak market during the fall months for many years to come. A sow bred January 1 should farrow April 22, and the pigs will be ready for market in November. These dates are fairly typical of the practice throughout the greater part of the West regardless of other conditions which are often more important. If two litters a year are to be produced, one litter should come in February or March, and the other in August or September, the kind of housing and the climate of the locality determining whether it is most advisable to have pigs farrowed at the earlier dates.

BREEDING

If more than five sows are to be kept in the herd, it will be more profitable to own a herd boar, while if less than five are to be kept, and if the service of a good boar may be procured from a neighbor, it will be less profitable to own the boar than to hire the service. Sows begin to come into heat when five or six months old, but should not be bred until they are at least eight months old, and fall-farrowed sows had best be a year old before being bred. Fall pigs do not develop so rapidly as spring pigs, so that at the same age they are not usually so large. Healthy sows will normally continue to come in heat every twenty-one days until they are bred. Several weeks before the regular breeding season begins a record may be kept of the date at which the various sows come into heat. In this way one may know how many sows will be in heat at a certain time so that none need be missed and the boar may be handled more intelligently. If two or more sows are to come into heat at the same time, it is well to breed one of them as soon in the period of heat as possible, and not to breed the other until toward the close of the period. If small sows are to be bred to a large boar, a breeding crate is almost a necessity, for the injuries to young sows will often amount to more than the price of a breeding crate. Likewise, the energies of the boar are conserved by the use of a crate. The one in Plate XVI was developed at the Oregon Experiment Station, and is as satisfactory as any. However, like fences for hog pastures, much is yet to be desired in the way of a satisfactory breeding crate. Not more than one sow a day should be bred to a boar and but one service should be allowed, if another sow is to be bred within a day or

two. If no other sow is to come into heat within the time, a sow may be served at the beginning of the period of heat, and also near the close, for the period of heat is not always coincident with the discharge of the ova from the ovaries. After a sow is served, she should be immediately removed from other hogs. The boar should also be removed to his own pen if he does not serve her there, and should be shut off from other hogs, or at least from sows. Using the boar in different pens is likely to make him unruly. Three weeks after the sow is bred she should be tried again, or if she shows evidence of being in heat before three weeks is up, she should be re-bred. If the boar and sow are both in good healthy condition, there should be few returns.

PREGNANT SOWS

Usually if sows do not come in heat three weeks after being bred, they will not come into heat again until after farrowing, but occasionally a sow will pass a period of heat and then resume. It is therefore wise to try the sow for at least two periods after she has been bred. When pregnant, young sows should be kept gaining at the rate of about one pound a day during the gestation period, and old sows if in reasonably good flesh should gain from one-quarter to one-half pound a day during the pregnant period. With old sows, which are very thin when bred, a larger gain than a pound a day is desirable, but in no event should a sow be made so heavy that her feet become sore.

The sow, during the pregnant period, requires feed containing an abundance of mineral and protein matter. In summer, if good pasture is available, heavy grain feed will not be required; in fact, some sows will make sufficient

gains on pasture alone, but the great number will require three or four pounds of grain in addition to pasture. Each sow must be fed according to her needs as shown by the weight and general appearance. Sows bred for spring farrow will require heavier grain feeding than those farrowing in the fall.

FARROWING

A week before each sow is due to farrow, she is separated from the herd and placed in a pen by herself so she will become accustomed to her new quarters and be more quiet at farrowing time. The farrowing pen need not be an expensive affair, and whether a single colony house is used, or a centralized house in which there are several farrowing pens, the essential features are the same; namely, dryness, freedom from drafts, light, ventilation, freedom from objects on which the sow can injure herself or her little pigs, and a rail to prevent the sow from mashing the pigs against the wall. If the sow is not already gentle, care should be taken during this preliminary period to get her accustomed to the attendant and responsive to kind treatment, so that when it is desired to make her lie down this can be accomplished without difficulty. A little gentle rubbing or scratching on the side of the belly will usually induce the sow to lie down. About twelve hours before the sow is to farrow, she will usually show a great deal of activity in making a bed. She will be gathering up such material as is available, and carrying it into piles, often starting a bed in several different places. If she has not been in her present pen very long, she will often try to get out, but if precautions have been taken to keep her there for a week before farrowing, she will usually be contented with her quarters. Two or three hours before

farrowing, there will ordinarily be milk in the teats, although neither of these signs is infallible. If the presence of any one in or near the farrowing pen seems to annoy the sow, the attendant should keep out of sight, but near enough to be of service if required. As labor comes on the sow usually lies on one side, and frequently appears oblivious to everything going on around her. She will get her breath at longer intervals, and after a few hard pains will usually give birth to her first pig. If after much labor no pig has yet appeared, the attendant may insert one or two fingers in the vulva to determine whether a pig has yet appeared in the vagina. Frequently if a pig comes hind feet first, the head will be wedged in the pelvis in such a way that the circulation through the umbilical cord will be cut off, and a pig so held will very quickly suffocate. If the feet are felt in the vagina, they should immediately be seized and pulled gently but firmly until the pig escapes, else he will come dead. Unless a sow is immature, high in the pelvis, or has run considerably over time, there should be little difficulty in giving birth. As soon as a pig arrives, if he gasps and gets his breath, the only precaution is to remove the mucous covering from his body and rub him vigorously to get him dry, and even this latter will not be necessary if the weather is warm. It is usually best to rub the mucus from the nose and after drying the pig, place him in a basket or box in which a woolen lining has been placed. However, if the sow is perfectly quiet, it will not be necessary to remove the pigs as they are born, unless the attendant is to leave the farrowing pen for a time. If any pigs fail to show signs of life when born, they should be examined to see whether the heart is beating, which can be noted by the palpitation in the umbilical cord. A

few slaps on the sides or blowing in his nostrils will usually start respiration if he has any life in him.

The after-birth is usually passed in two installments, the passage of the first portion marking the emptying of one horn of the uterus, while the remainder is ordinarily passed after the last pig has come. The after-birth should be immediately removed from the pen, and buried or burned, or at least placed where the sow or other hogs cannot eat it. If this is not done the habit of eating pigs may be acquired.

After the pigs are all born and the sow is quiet, all the pigs should be placed to the sow to suckle, if they have not already done so. It is well to squeeze each teat a little to make sure that milk can be drawn from each one, and if there are more pigs than there are good teats, it is advisable to give some of the pigs to another sow, if this can be done; and if not, kill them or raise them by hand. The value of the pigs will determine which is the more desirable course to pursue. If this is not done there is great danger that the pigs may bite the sow in their efforts to possess themselves of the teat, and cause the sow to mash some of the best pigs in the litter.

When the pigs have sucked until they are satisfied, they should be removed to their box again, and fed every two or two-and-one-half hours until they are forty-eight hours old. Very little bedding is allowed the sow at farrowing time, or for several days afterward, if the pigs are left with her; and such bedding as is provided should be finely chaffed, so that the pigs cannot become entangled in it. Troughs and other objects which the sow can move, and which are heavy enough to injure the pigs if rooted upon them, should be removed from the pen when the sow and pigs are left alone. A sow which experience has

shown to be a poor milker should be fed a milk-forming ration for several days before farrowing. On the other hand a sow which is known to be a fine milker should not receive such a ration until two or three days after farrowing. A good milk-forming ration for a sow which is not on pasture may consist of six or seven pounds of barley, with one-half pound of tankage, or three pounds middlings and five pounds ground barley, six pounds of rolled wheat, and one-half pound tankage; two pounds ground oats, two pounds ground rye, two pounds middlings, and one-third pound tankage. Any of these rations should be fed in connection with ten to fifteen pounds roots, kale, green clover, or green alfalfa if they are in season, or if skim-milk is available, ten to fifteen pounds of skim-milk may take the place of the succulence and the tankage. For a sow of which heavy milk production is not desired, the succulent feed may be cut in two, and the grain ration reduced to four pounds a day. To dry a sow up if she has been running on pasture, the other feed may be discontinued entirely, and if the pasture is rank, it is best that she be removed from pasture for three days, and fed only three or four pounds of ground oats.

If the sow has been fed a milk-forming ration before farrowing time, she is likely to have plenty of milk, and in fact, may have too much. Individual sows differ greatly in this respect. If the sow has little or no milk at farrowing time, it is necessary to feed her a stimulating ration to start the milk-flow, and if this cannot be done quickly, it is necessary to hand-feed the pigs until milk is provided. Fresh, warm cow's milk, and a medicine dropper should be secured, the pig placed with his mouth on the sow's teat, and the milk slowly dropped on the upper side of the teat so that the pig gets the milk as he

sucks. In this way the pig is receiving extra feed without knowing it, and without losing the habit of sucking the sow. It is very difficult to get pigs to suck after they have been hand-fed; so that hand-feeding should be resorted to only in cases of the absolute failure of the sow. If the sow has more milk than the pigs can take during the first few days, a husky, hungry pig from another sow may be allowed to suckle out the teats which the little pigs do not empty; this is the best way to prevent caked udders, and at the same time keep the teats in good condition, so that they will be available for the little pigs when they need them all. If the sow has an insufficient quantity of milk, the pigs are likely to follow her around the pen, and some of them be trampled upon.

After a week or ten days, or sooner if the pigs are taking all the sow's milk, she should be put on full feed of a milk-forming ration. The aim should be to maintain the sow's flesh, although this is almost impossible if she is a heavy milker. Since the gains on young pigs are the most economical which they make, it is desirable that as rapid gains as possible be secured during the milking period. In late spring or early summer the sow should be turned into pasture if at all convenient, but care should be taken to prevent the pigs from contracting pneumonia when first turned out into pasture. Sows with fall-farrowed pigs should be given abundance of succulent feed along with their grain feed.

CASTRATION

Castrated pigs will make more satisfactory gains themselves and will allow other pigs to gain more satisfactorily. The meat from castrated pigs, or barrows, is more palatable than that from boars, and the reproduction of

undesirable pigs is prevented by castration. Pigs should be castrated when about six weeks old, or two weeks before they are weaned. To perform the operation the pig is laid on one side, an attendant holds the pig by the front and hind foot which are on top, and the operator holds the testicle between the thumb and forefinger with the left hand, holding the knife with the right. The lower testicle should be removed first, so that the flow of blood will not interfere. An incision is made parallel to the septum, about half an inch from it, and extending a little below the lower point of the testicle. This is to prevent the formation of a pus pocket in the bottom of the scrotum, which would be likely to cause difficulty when the wound heals. The skin and the membrane covering the testicles are cut through, the testicle is squeezed out, and either pulled out entirely, or pulled out until the cord connecting the testicle with the body is an inch and a half or two inches long. Then the cord is gradually cut or scraped off near the body. Some disinfectant should be rubbed over the scrotum and adjacent parts before the incision is made, and it is well to wash out the wound with disinfectant. Any of the standard sheep dips will be found satisfactory for this purpose.

Pigs which show an enlargement at one side of the scrotum are usually ruptured, and require special treatment. It is best that a veterinarian operate on such animals until the pig-raiser becomes familiar with the operation. The loss of ordinary healthy pigs from castration is very small, while that with ruptured pigs is nearly fifty per cent.

WEANING

If two litters a year are to be produced, it is necessary that the pigs be weaned at eight to ten weeks, while

with only one litter pigs may be allowed to run with the sows for three or four months, or until the sows wean them themselves. Small pigs should be induced to eat as soon as possible after they are farrowed, and are usually at least three weeks old before they take any other feed than their mother's milk. Every inducement ought to be offered them to eat as much as possible of the right kind of feed. Sweet skim-milk and middlings make an excellent combination, and since these feeds are rather expensive, it is not always desirable to allow the mothers to have the same ration. Hence, a creep, or enclosure into which the pigs have access, but which excludes older hogs, is often desirable. The creep should be provided with both feed and water troughs so that pigs will not be compelled to crowd in with older hogs either to eat or drink. It is considered a good practice to wean all the pigs from a sow at the same time, having begun to cut down the feed of the sow prior to weaning. It is a good plan also to change the character of the feed of the sow, so that it will be less conducive to milk-formation. Shutting the sows off pasture, and withholding succulent and concentrated feeds, will help materially in decreasing the milk-flow, and if the entire ration be decreased, but little trouble should be experienced in getting sows to dry off without any caked udders or any derangement. Some prefer to leave one or two of the pigs with the sow in order to draw off the surplus milk, but these ordinarily suckle only one or two teats. Other breeders prefer to take the pigs from the sow and return them to her after twelve hours, and gradually prolong the intervals between feeding until the sow is dry. This entails more trouble, and may result in digestive derangements of the pigs.

FEEDING THE WEANLINGS

If the suckling pigs are induced to eat grain as early as possible and have all they can consume, weaning brings about little hardship. If two litters a year are to be produced, ten weeks is as long as the pigs may be allowed to suck, and at this age should have had five weeks in which to become accustomed to artificial feed. If any change from the ration on which the suckling pigs were started must be made, it had best be done gradually and before the pigs are weaned. In any event the change must be brought about carefully to avoid digestive trouble, waste, and pot-belly. The digestive tract of a small pig is larger in proportion to his body than when he grows older. Hence it is possible at this time to over-feed a pig; but the more common mistake is under-feeding. Another illness which may result from over-eating is impaired efficiency of the entire system, so that the gains in later life are secured at greater cost than should be. Pot-bellies result from the too long continued use of very bulky or watery feeds. Little trouble of this kind, however, is likely to result from the feeding during the first seven weeks, but where pigs suckle for as much as three months, such troubles are not unusual.

With little pigs both before and after weaning, care must be taken that no feed be left in their troughs to become sour, or scours will almost surely result. Therefore but little should be given them and what is left removed and given to their dams. Then their trough should be thoroughly cleaned, and if possible, with the very youngest pigs, scalded and set up in the sun. At all events the trough must be left clean, and should be so when feed is put into it again. A good start makes

success possible; a bad one makes success very uncertain. The advantages of the creep are that cleanliness is more easily secured, and a smaller amount of high-priced feed is necessary, as the sow does not require so expensive a ration.

If green pasture of any kind is in season, the weanling pigs should still have access to it: and if they are to be hurried for market, their other feed should be continued in liberal quantities. If skim-milk is abundant enough to permit its use in quantity for the pigs, it may be fed to them twice daily in quantities not to exceed eight pounds to 100 pounds live weight. Their other feed may well be given through a self-feeder, or it may be given by hand either at noon, if they are not to be hurried to the limit, or at morning and night if they are. A better return will be made for the skim-milk if used at the rate of only five pounds for each 100 pounds of live weight. The other feed of the pigs at this time may be ground oats, barley, wheat, speltz, kafir, milo maize, or corn, according to the price. If skim-milk is not available for the weanling pigs, tankage, about one part to ten of grain, making a nutritive ratio of about one to five, will be found satisfactory. Oats should not form to exceed one-third of the ration if rapid gains on the pigs are desired, but if only moderate growth is to be secured, ground oats may form the greater portion of the grain ration. If more rapid finish is desired, the proportion of ground wheat or ground barley should be increased so as to form at least two-thirds of the grain ration. A good quality of middlings is more valuable than any of the grains if fed in connection with other feed, but as a single feed is unsatisfactory. In any event, except for the suckling pigs, one should not pay more than $5.00 a ton more for middlings than for the

grain, and with ordinary prices of grain, $2.00 a ton is the maximum premium that could be given for middlings. Barley and wheat are of practically equal value with corn, while speltz, the non-saccharine sorghums, hog millet, oats, and rye, generally range in the order given. In connection with good pasture, two and one-fourth pounds of grain feed should be allowed to each 100 pounds live weight of pigs, and if pastures are poor, the amount of grain should be increased.

Clover, rape, alfalfa, green wheat, and mixed grain which is not over five inches high, make satisfactory pasture. Rape will afford more pasture when sown in rows and cultivated until six inches high. In this way the plants will be tramped very little, and will start up several times during the summer. Clover, in early summer, and the second growth if rains follow the cutting, affords good pasture. Irrigated alfalfa is second to none. As a rule, liberal feeding of the growing pig is profitable, since feeding simply for maintenance nets no profit.

Selling the pigs at feeder size is practiced to a considerable extent when plenty of alfalfa and but little grain is grown. These feeder pigs are taken to the grain regions for finishing. Local conditions will determine whether there is any profit in this business.

NUMBER OF PIGS TO THE ACRE

The Eastern Oregon Experiment Station found that when no grain was fed, twelve pigs kept an acre of alfalfa cropped close, while with a self-feeder, twice as many pigs could be run to the acre.

Rape pasture, if conditions are favorable, will carry about ten or twelve pigs to the acre. The carrying capacity will be somewhat increased if the pasture is

divided into two parts and the pigs alternated from one to the other.

Clover will carry a somewhat larger number, because of its deeper rooting system and longer growing period. If the pasture is fairly large so that the area likely to be tramped excessively is a smaller proportion of the pasture, twelve to fifteen shotes or five or six mature dry sows may be run to an acre.

Many experiments have been carried on to determine the amount of pork which can be produced from an acre of pastures, both with and without grain rations. It is obvious that no one test would be very wide in its application, nor would an average of these tests mean any more, especially when most of the gain is made from the grain rather than the pasture. It is safe to say, however, that reports of pastures paying $40.00 to $100.00 an acre when used for pigs are misleading, even when technically correct. The judicious use of pasture nearly always lowers the cost of gains as compared with any other system of feeding, but the saving is not usually very much in excess of a fair rental of the land.

In selecting pasture, the points suggested by Evard in Iowa Bulletin 136 should be kept in mind. "An ideal forage for hogs should show: 1. Adaptability to local soil and climate; 2. palatability; 3. a heavy yield of digestible nutrients, being high in protein and mineral matter, especially calcium and phosphorus, and low in crude fiber; 4. succulence; 5. long pasturing season; 6. ability to endure grazing; 7. permanency; 8. reasonable cost and ease of seeding; 9. capability of furnishing good pasture at any time during the growing season. These essentials are not found in any single forage, but alfalfa, the clovers, and rape have most of them."

RINGING

When the weanling pigs are run on pasture, as is usually the case, both they and their dams will probably require ringing. Ringing consists of inserting pig rings in the cartilages at the top of the pig's snout to prevent rooting. Fish-hook rings are most satisfactory for larger hogs and should be placed in the nose so that the loop is at the front of the snout, and the point protruding forward through the loop. Pigs still sucking should not be rung with fish-hook rings since these rings injure the sow's udder, so if rung at all, the plain rings should be used. Small pigs will require but one small size ring, while old sows will require two or three larger size rings. If two rings are used, they should not be over one-half inch apart, and should be at either side of the middle. The necessary apparatus for holding the hogs and for inserting the rings has been described under equipment.

CHAPTER XXIX

FATTENING FOR MARKET

FATTENING swine for market covers that part of the pig's life from the time he is put on full feed until he is ready for slaughter. Usually a pig weighing from 80 to 125 pounds is known as a feeder, and is put on fattening feed to finish him for pork.

Fattening, as the term implies, increases not only the absolute weight of fat in the pig's body, which is one of its main purposes, but increases the proportion of fat to other constituents. Since lean meat contains a greater proportion of water than does fat meat, making a pig fat also decreases the amount of water in the carcass. This renders curing easy without hardening of the meat by the abstraction of too much water, and without the meat taking up too much salt. Making the pig fat increases the dressing percentage and, within reasonable limits, improves the flavor and quality of the meat. The butcher, therefore, insists on purchasing a fat pig and will pay more for it since the fat pig yields better meat and more of it. A thin pig may not dress over 70 per cent, while a fat one will dress 75 to 80 per cent. The feeder wishes to have his pigs fat when he sells them, for fat is usually put on at less outlay for each pound than it costs to grow the pig's frame, while the fat pig will bring from 1 cent to 1½ cents a pound more for slaughter than will the same pig in thin condition. In addition to those noted, other signifi-

cant changes are going on in the pig's body. A certain amount of muscular cells undergo fatty degeneration, making the meat more tender and delicious to the epicure, but at the same time rendering the pig weaker and less efficient as a machine for transforming feed into pork. This is one reason why more and more feed is required to produce gains as the pig approaches market maturity and why, when once fat, he should be marketed as soon as possible. The debilitation process also accounts in a measure for the greater susceptibility of fat pigs to disease. Fattening increases the body weight which has to be maintained and this in turn increases the cost of the gains.

WHEN TO BEGIN FATTENING

The western markets nearly all demand a smooth, nicely finished pig weighing about 200 pounds. It is found that with a pig in good growing condition at the start, it takes about sixty days on full feed to produce the desired finish and that during this sixty day period, he will put on about 100 pounds of live weight. This means, therefore, that the fattening process should begin when the pig is not to exceed 100 pounds live weight. If heavier than this, he will not be fat until too large for the market requirements, while if too small at the start, he will become too fat to gain economically before reaching market weight. Of course if the pig has been grown on liberal feed and is already in fair condition, he will require less time to fatten than if he had been grown less rapidly and is thinner in flesh at the start. A pig at 100 pounds live weight should be from four to six months old. If much older than six months, it is practically impossible to finish him into a good market hog and he will always be rough and ill-shaped.

STANDARD FEEDS

At the beginning of fattening average pigs are given about four and one-half pounds of feed for each 100 pounds of live weight. This is increased until within a week the pigs are receiving all they will clean up in thirty minutes. If they are to be fed on the self-feeder, a little larger increase is given before turning them to the feeder.

The basis of the fattening ration must in all cases be one of the cereals. As proven by many tests at the Oregon Experiment Station, corn, wheat, and barley have about the same feeding value, pound for pound. The choice between these must, therefore, be determined by their cost, the preference always being for the one that can be grown or purchased the cheapest. Speltz, emmer, kafir, and milo maize are suitable for fattening, but should be supplemented a little more liberally with protein feeds than corn, wheat, or barley, and even then not quite as good gains will be secured with a given quantity of feed. When purchased, these grains should be procured at one-fifth to one-fourth less a ton than wheat. Oats, rye, and speltz should only be fed with other cereals and supplemented with protein feeds. A grain ration consisting of one-third oats or speltz and two-thirds wheat, barley, or corn may be expected to yield practically as much gain as a ration of wheat or barley alone, providing that in each case they are properly supplemented. Rye gives better results in connection with oats or barley than with wheat or corn. If rye is cheaper in price than barley, one-third of the grain ration may be rye.

Canada field peas are adapted to much of the semi-arid regions lying either side of the Rockies. Any quantity of pea-meal up to two-thirds of the ration will save

a little more than its weight of any of the cereals. Unfortunately, peas are usually too high in price to be utilized with advantage in fattening hogs.

A mixture of grains will usually be found superior to any single grain; and with the exception of field peas, any of the above feeds will give better results when properly supplemented with a protein feed. With the possible exception of corn, grinding will be found profitable and even with corn there is usually an advantage in grinding during the finishing period of fattening. None of the other treatments ordinarily given grain for fattening pigs has any advantage.

SUPPLEMENTAL FEEDS

Although most of the nutrients needed by the pigs must be supplied by the grains, it has seldom been found satisfactory to use grain alone. The grains may be lacking in protein, mineral matter, palatability, bulk, or succulence, so that the addition of some other feed may be desirable. These additional feeds are designated as "supplemental," since they supplement rather than replace the grain in the ration. The rational use of supplemental feeds is the real test of a skillful feeder.

Since most of our farm grains are deficient in protein, supplements are judged largely as a source of this nutrient. Alfalfa hay is high in protein and although suitable for brood sows and boars, is too bulky for fattening. It may be used to fair advantage at the start. Its continued use in any considerable quantities will almost certainly result in slower gains, and a poorer finish. Alfalfa pasture is as bulky as the hay, but is more palatable. In the irrigated parts of the West, alfalfa is usually so cheap that

it is used to excess. In the many tests that have been conducted with alfalfa pasture or hay, without grain, it is only rarely that the pigs have made any gain. The best results have so far been obtained where the pigs were given grain in a self-feeder and so not forced to consume any more alfalfa than they wished. When such supplements as skim-milk or tankage are available at reasonable rates, they may be profitably used in addition to the alfalfa but of course in smaller quantities than when no alfalfa is used. Bran, like alfalfa hay, carries too much bulk to be desirable feed for fattening pigs and in addition is very expensive on the basis of the nutrients contained. Middlings and shorts can be depended on for a considerable part of the supplemental protein if they may be procured for little more than the price of the grain fed, and the distance to haul is not too great. Linseed-oil meal is used to a considerable extent in the North Central states, but even if flax-growing should assume considerable proportions in the Northwest, the price of oil meal will never be low here on account of its value to the dairyman. Soybean meal is being imported in small quantities from Manchuria and it is barely possible that it may be unloaded on the Pacific Coast at a price which will make it available as a supplemental pig feed. Since soybean meal has about the same percentage of protein as linseed-oil meal and very nearly the same carbohydrate equivalent, it is evident that it should be procured at practically the same price, or less than the latter, else there is no inducement for using it in preference to American-grown products. Cotton-seed meal has a third more protein, as well as a little more digestible carbohydrates than the two above named meals but because of the poisonous effect it exerts when fed in large quantities to pigs, it should not

be used for longer than six weeks. It can usually be obtained at a price little above that of linseed-oil meal.

Tankage, one of our best supplements, is a by-product of the meat industry. Scraps of meat and other offal from the slaughter houses are cooked in a closed steam tank to remove all the grease. After the grease is skimmed off the residue is dried and ground and the better grades used for pig feed and the poorer grades for fertilizer. Tankage is commonly the cheapest source of supplemental protein, and is likely to remain so, since it is not used by any other stock and must, therefore, be sold to the hog-raiser. Tankage is the highest in protein content of all the feeds named, carrying twice as much as linseed and soybean meal, and a fourth more than cotton-seed meal. It may be fed for an indefinite period without injurious results. It carries nearly seven times as much protein as barley or corn, and costs but twice as much.

In localities adjacent to creameries and cheese factories, skim-milk, buttermilk, and whey are often available in larger quantities than are needed for younger pigs, and these by-products of the dairy industry all have value for fattening pigs. Used in quantities of two to ten pounds a head, the Oregon Experiment Station has found skim-milk to have a value of about 22 cents a 100 pounds as compared with tankage at $45.00 a ton. As compared with barley feeding alone, it doubtless has a much higher value than this. Some experiment stations give it a value double this, when compared with corn feeding alone, but it is obviously more fair to compare it with the cheapest satisfactory source from which supplemental protein can be secured, since grain alone is always unsatisfactory.

GAINS

A pig on full feed should gain from one to one-and-three-fourths pounds daily and should make 100 pounds of gain on about 425 pounds of feed. The daily maintenance requirement is about one per cent of the live weight of the pig and about one-fourth of a full feed for mature swine, but less than one-fourth of a full feed for growing and fattening pigs. A 100-pound pig can consume six pounds of feed daily, while the average daily feed consumed by 200-pound hogs is only about seven pounds. As a practice, heavy feeding during fattening is most economical because rapid gains involve a shorter feeding period and a smaller consumption of feed for maintenance. High finish also is not secured on pigs which make their gains slowly; for they grow instead of fatten, and mere framework without finish will not bring top prices. The age of pigs affects the economy of gains as well as the quality of the carcass, and the consequent price for each pound. In the western markets, there is a difference of nearly a cent in the prevailing prices of heavy hogs and of 200-pound pigs. This is not only in accord with the desire of the consumer, but is economy to the producer, since younger and smaller pigs produce more economical gains than older or larger animals.

Experiments have shown that, other things being equal, pigs will gain more rapidly and economically on three feeds daily than on two, but usually not enough to pay for the extra labor involved. This is, of course, in accord with the better gains made on the self-feeder.

The palatability of a ration determines in a considerable degree its usefulness to the pig. If unpalatable, the pig will not eat as much as is required for economical gains

and may eat only enough for maintenance, thus making no gains at all.

It has been noted that sufficient protein in a feed increases the digestibility of the other nutrients. It has also been found that the addition of protein to a ration deficient in that nutrient causes an increased consumption of feed.

In conclusion the following points may be noted: that the purposes in fattening swine are to increase the edible meat and dressing percentage, to decrease the proportion of water, and to improve the texture of the meat; that approximately 1 per cent of the live weight in digestible dry matter is required for the maintenance of the pig; that rather more protein than exists in ordinary farm grains is necessary for economical pork production; that the price paid for protein supplement should be in general proportionate to the protein content, but the carbohydrate equivalent should be given a value of about two-thirds as much for each pound as the protein. The supplemental feeds should be guaranteed as to the protein they contain.

CHAPTER XXX

METHODS OF FEEDING

Hog raisers have for generations been trying to find some method of finding that which would give to the feed some added nutritive value. In recent years even the chemists have tried to discover chemical processes that would increase the value of the feeds. Of the various methods that have been suggested, those in more or less common use to-day are: cooking, grinding, soaking, and the use of self-feeders.

COOKING FEED

Cooking feed has been largely abandoned, because it has been found that the digestibility of most feeds is diminished by cooking. Potatoes seem to be the one exception. When cheap enough to feed to pigs, potatoes will pay a profit for cooking if the equipment does not cost too much. It seems fairly well determined that at the present time no one would be justified in installing an expensive cooker, for ordinarily potatoes are more valuable for human food than for pig feed, and in localities where they are not, other crops would furnish more nutrients at less cost. Potatoes are cooked in order to decrease the water content and to burst the starch cells. Steaming is more desirable than boiling, and in the latter process, if the water is drawn off and the potatoes left

over the fire long enough so that they have a mealy appearance when they are opened, they make better feed than if left in the water in which they were cooked and have the meal mixed with them.

GRINDING

Grinding feed is a profitable practice at the prevailing prices of grain. The saving is about 6 per cent with corn, from 12 to 20 per cent with barley, oats, and wheat, and even a higher percentage with hog millet and weed seed. Grinding, if performed at all, should be thoroughly done and the meal made fine. In addition to the actual saving of feed required to produce 100 pounds of gain, grinding feed will usually secure a better finish and consequently is sometimes practiced only at the close of the fattening period. The desired finish is thus secured without the larger expense involved in grinding the feed for the entire period. Likewise, younger pigs chew their feed better than older ones, therefore older pigs are more likely to pay a profit on grinding than are younger ones.

SOAKING

Soaking feeds which are so excessively hard that they are not likely to be well chewed unless so treated, may be of some advantage. It is very probable, however, that some sugar may be dissolved out and possibly become fermented if the weather is at all warm. Soaking may take the place of grinding if the cost of grinding is excessive. With ground grain, no advantage due to soaking is noticed, although merely wetting before feeding is a good practice, in that it prevents the finer parts from being blown away, or from being inhaled by the pigs.

OTHER METHODS

Other methods of treatment, such as steaming, roasting, fermenting, malting, and predigesting with various acids and caustics, result unfavorably, because they either destroy or render less available some or all of the nutrients contained in the feed.

SELF-FEEDERS

The self-feeder attempts to decrease the labor cost incident to pork production. By this method, once a lot of fattening pigs are on full feed, a correct ration may be put into the bin to last a week or more, and only slight

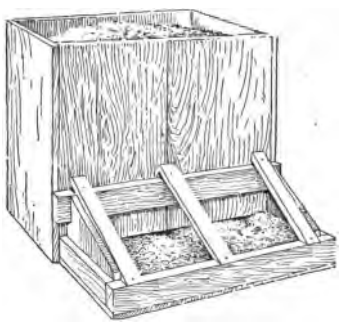


FIG. 37. — Small Self-feeder for Hogs.

attention need be paid to that feeder for several days. The use of the self-feeder has been general in the West for many years and while much labor was saved it was commonly believed to be less economical of feed than hand feeding. Several years ago tests were begun at the Oregon Experiment Station at Corvallis and at the Eastern Oregon Experiment Station at Union to determine just how much loss there was in using the self-feeder. As a result of

numerous repeated tests it was found that 100 pounds of feed put in the self-feeder would actually make more pork than if fed by hand in the most approved manner. The very great practical value of the self-feeder was therefore

FIG. 38. — Self-feeder.

put beyond all question. Later an extension of this system to eliminate the labor of mixing feeds has been put into practice by the Iowa Experiment Station. Several self-feeders in which were placed various ground grains and tankage, each in separate compartments, were provided, and the pigs were allowed to balance their own ration.

CHAPTER XXXI

OPERATIONS AND MINOR AILMENTS

EVEN with the best of care, pigs will require some veterinary attention, but because of the relatively low value per head in comparison with the fee, one hesitates to call the veterinarian. The ability to handle the more common work of this nature determines largely the success of the pig-man; in fact, these apparently small jobs form no inconsiderable portion of his duties.

WOUNDS AND ULCERS

Not infrequently lumps or ulcers are seen on the various parts of the hog's body. These are usually due to abrasions in the skin which may have healed up on the surface, leaving only a white scar. Such abrasions are usually caused by nail pricks and by contact with sharp points on fences, usually at corners or passageways, and the pig-man should be constantly on the alert in removing such sources of troubles. Pus-forming germs gain access to the system through the abrasions and may cause pus pockets in the pig's flesh to considerable depth. As the abrasion heals very quickly, no point of discharge for the pus is open until the tissues become sufficiently soft to break of themselves, or until an incision is made by the operator. Such ulcers, if noted very soon after they form, may be treated by simply washing them with a disin-

fectant, and lancing with a clean knife, care being taken to reach the bottom of the pocket. The wound should then be washed with disinfecting solution, such as ordinary sheep dip, and the animals kept in a clean, dry pen. A little attention should be given to the wound that it does not become infected again, the abrasion in the skin being kept open until the tissues below have healed. In the case of larger ulcers, it is usually best to have a veterinarian

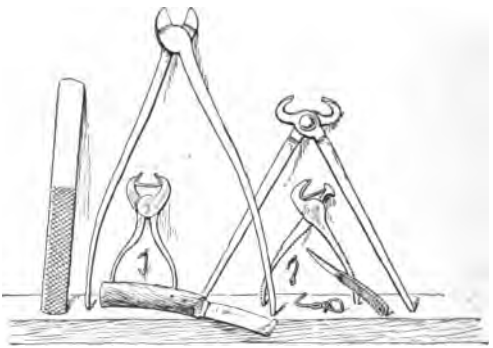


FIG. 39. — Tools for Minor Operations.

remove them, since a considerable amount of abnormal tissue ordinarily must be dressed out, and the layman is not always able to discriminate between the abnormal and the natural tissues.

CLIPPING LITTLE PIGS' TUSKS

Another frequent cause of ulcers on the bellies of sows suckling pigs is the wounds inflicted by the tusks of small pigs. In the efforts of two or more pigs to acquire the same teat, it not infrequently happens that one pig in attempting to bite another, inflicts a wound on the

sow's belly to which pus-forming germs gain access. Such wounds, if treated immediately with an antiseptic solution, may cause no further trouble if the pigs are prevented from repeating the offense. On examination it will usually appear that the pigs which are most pugnacious have several teeth which are considerably longer than normal. Not infrequently these irritate the lips of the pigs, so that they do not care to suckle as normal pigs would, and the result is that when the others suckle, these want to prevent them from doing so. A small pair of pruning shears or dental clippers may be used, and the teeth removed to the level of the others. This is but little trouble, and it should be attended to soon after the pigs are born, to avoid having to treat wounds later on.

MILK FEVER

It sometimes happens that a large quantity of milk will be present in the udders of sows before the pigs are farrowed. This may be due to too stimulating a ration during the gestation period, and it is sometimes due to the failure of the sow to deliver the pigs when they are ready. Partial paralysis or abnormal condition of the genital organs may make parturition unduly late.

The approach of trouble may be noticed if the sows have milk in the udders more than two or three hours before the pigs arrive. One or more sections of the udder will be abnormally full, then gradually harden, and finally the hardened area extends until the entire udder may be involved. The milk should be drawn from the teats which are beginning to harden, or if the hardening has already become general, the udder should be treated with castor oil, which has been heated to a temperature as warm as

the human skin will bear. A flannel cloth should be dipped into the castor oil and spread over the sow's udder, after which hot packs may be placed over the flannel. If the pigs are alive and healthy, they will prevent the spread of the trouble to other parts, and only such portions as are already hardened need be given attention.

PARALYSIS

Young pigs in high condition, and receiving but little exercise, are sometimes troubled with the loss of the use of the hind legs. Several causes may be responsible, but relief may usually be secured by compelling the pigs to exercise, and feeding them a ration containing plenty of bone-forming material, as might be obtained by adding a little steamed bone-meal to their ration. One form of the paralysis which does not respond readily to such treatment is due to a pressure on the spinal cord caused by the dislocation of vertebræ, or by the inflammation of membranes surrounding the cord. In older hogs, especially in pregnant sows, partial paralysis of the hind quarters sometimes occurs, and is usually fatal. Little can be done except to remove the animal from the others, so that further injuries will not be inflicted. The bowels should be loose, and if necessary a soapsuds enema given, or a dose of salts or calomel, and the animal kept on a nutritious diet. Occasionally, animals so affected will recover after farrowing, although of course it is impossible for a sow in such a condition to give birth to vigorous pigs, or to raise them herself.

WORMS

The worms which cause the most frequent trouble in pigs are the round intestinal worms, which inhabit the

small intestines. Sometimes in very bad cases, they will traverse the bile duct, clogging the duct and reaching to the liver. It is not always possible to see worms passed from these pigs, but usually if the infestation is at all bad, an occasional worm will be seen in the feces. A lack of thrift in the pigs and failure to respond to even large quantities of good feed will be apparent.

To treat the pigs successfully, they should be placed in a dry pen for twelve hours, and then given a good vermifuge mixed with their feed. The most satisfactory vermifuge consists of three to five grains of santonin, and five to eight grains of calomel to each 100 pounds of live weight. The pigs may be weighed up, the feed distributed in a long trough, and the drug sprinkled over the feed before the pigs are given access to the trough. The pigs should be confined for twenty-four hours longer in the dry pen so that the worms which are discharged may be gathered up and burned. It is obviously more convenient if the pen in which the pigs are kept has a tight floor, so that after the droppings have been scooped up, the floor may be thoroughly disinfected with a strong solution of sheep dip, so as to destroy any eggs which have been left on the floor.

BRONCHIAL TROUBLE

Pigs farrowed in damp, cold weather when exercise out of doors is difficult and when little sunlight is available, frequently suffer from bronchial troubles, the most common of which is bronchial pneumonia. Due to a lack of exercise, considerable quantities of fat accumulate about the pigs' chests and throats, making breathing difficult, and starting an inflammation of the membranes lining the bronchial tubes. The inflammation may spread

to the lungs and pleura, and germ infection may follow, causing a thickening of these parts, so that breathing becomes difficult. Spasmodic contractions will be observed in the region of the abdomen whenever the pig attempts to move rapidly. There is nothing so effective in treating this difficulty as sunshine and exercise in the open air and the disease is most troublesome when conditions make this treatment difficult or impossible. In acute cases, a few drops of kerosene placed in the pigs' mouth or nostrils may remove a sufficient quantity of mucus slightly to prolong the life of the pig, but unless weather conditions make recovery possible, there is but little use in this treatment. This disease is also frequently brought on by damp bedding or drafty quarters. The remedy for such cases is obvious. Loss from bronchial pneumonia is one of the most serious obstacles to mid-winter farrowing, even under most favorable conditions.

TRIMMING FEET

The toes of older hogs frequently become so long as to throw too much of the weight on the rear part of the foot, causing a straining of the tendons and the pasterns. If not attended to, the pasterns may become so weak that they will remain permanently broken, even when the toes are leveled up. If the toes are not too long, a sharp knife or a rasp may be used. If the toes have become very long, a pair of blacksmith pinchers may be used to take off the surplus, after which the smoothing is done with a knife or rasp. This operation will prolong the usefulness of a brood sow and is generally necessary in fitting older hogs for showing.

CUTTING BOARS' TUSKS

Boars which are a year old or over, develop long tusks with which they may injure other hogs or the keeper or which sometimes may interfere with the boar's eating. Removing the tusks makes the boar more quiet and tractable besides making him safer to handle. Several instruments have been suggested for the purpose; among these being the file, hack saw, crowbar and cold chisel, pinchers, and clippers. The last method is preferred.

The boar should be confined in a small pen, preferably where there are strong posts to which he can be snubbed. A loop of rope should be placed over the upper jaw of the boar far enough back so that he cannot pull out of it. He should then be snubbed up fairly short to a strong post, and the operator should keep behind the boar's head; that is, farther from the post than the boar's mouth. In this way, the operator keeps out of the way of the boar's reach. With a pair of clippers the tusks can be cut off close to the gum, but care should be exercised to avoid breaking them in the gum, thus causing a sore mouth. Plate XVI is of a 600-pound vicious boar which was operated on by one man.

MARKING

Marking pigs for future identification may be done in several ways. The two most common methods are ear buttons, and notches in the ears. Buttons are rather easily torn out by the pigs fighting, and are hard to read. Notches sometimes become obliterated by pigs biting each other's ears, but will not be destroyed nearly as often as will the ear buttons.

A system of marking, to be remembered, should be

systematic. The most satisfactory one is described as follows: One notch on the outer margin of the left ear, half way between the tip and base, means one; a similar notch on the same location of the right ear means ten. Two notches on the outer margin of the left ear, half way between the point and base, means two, and similar marks on the right ear, twenty. A single notch near the base of the left ear, on the outer margin, means three, while a similar notch on the right ear means thirty. A three notch and a one notch mean four, and a thirty notch and a ten notch mean forty. A notch at the tip of the left ear means five, and a notch at the tip of the right ear means fifty. Six is five and one, seven, five and two, eight, five and three, nine, five and three and one; while sixty, seventy, eighty, and ninety are like combinations on the right ear. A single notch on the front margin of the left ear, about half an inch from the tip, is 100, while a similar notch on the right ear is 1000. Two notches near together on the front of the left ear mean 200, and similar notches on the right ear, 2000. A notch near the base of the front margin of the left ear is 300, and a similar one on the right ear is 3000. A hole punched through the middle of the left ear is 500, while a similar hole through the right ear is 5000; 400 is made with a 300 and a 100 notch; 600 of 500 and 100; 700 of 500 and 200; 800 of 500 and 300; 900 of 500, 300, and 100; while the corresponding thousands are made up in the same way, except on the right ear. Other systems suggested are based on the number 3 instead of 10, but the decimal system is much more satisfactory. The hardest numbers to make out are the three and thirty notches. But if these are not placed too near the head, they can ordinarily be read without having to feel for them. If market pigs only

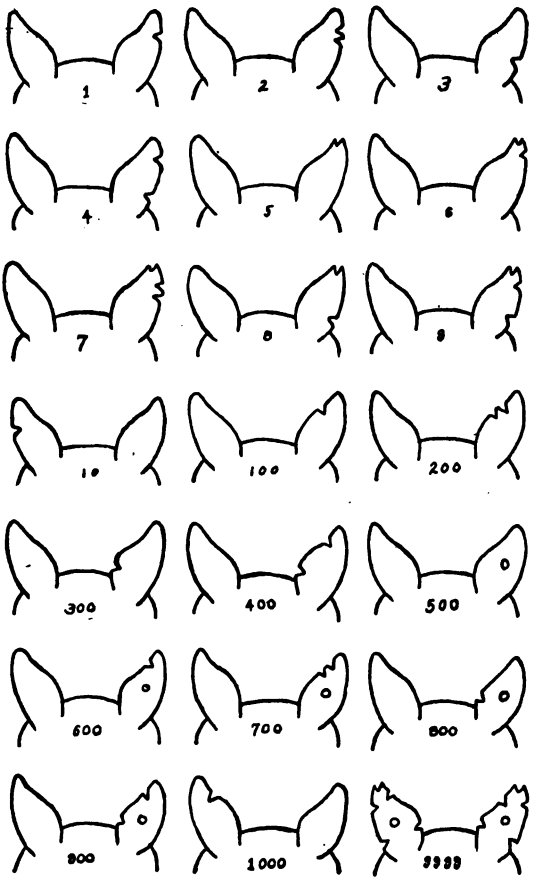


FIG. 40. — Marking System.

are to be produced, the tip may be removed for about three-quarters of an inch from the left or right ear for three or thirty, and if a five notch is to be used in either ear it may be cut in the middle of the cut edge. It is next to impossible to see the number at the base of the ear when the animal has long hair about that part, so that it is frequently necessary to feel for this notch, which is a great trouble in some cases. (See Fig. 40.)

CHAPTER XXXII

PURE-BRED SWINE

WHILE pure-bred swine are relatively more numerous than pure-bred sheep, cattle, or horses, they do not yet produce any large portion of our meat supply. Consequently the breeders of pure-bred swine are raising breeding stock rather than producing commercial pork. On account of this greater abundance of pure-bred swine and the consequent keener competition among the breeders, the selection of only the best stock is even more important, if possible, than with other animals. The proportion of pure-bred hogs which must be sold for pork is large, especially in slack times. This condition is very favorable for the development of the industry as a whole, although it may make it a little hard financially on the amateur who tries to start out with second-grade stuff.

BREEDS

The Berkshire, Poland China, Duroc Jersey, and the Chester White are the leading breeds in the West. With any one of these neither success nor failure can be charged to the selection of the breed. The Hampshire is growing in popularity and in many places must be counted with the standard breeds. The other breeds may be as well adapted to western conditions as the five named, but so far they must be considered as an experiment.

MANAGEMENT

The heavier investment in pure-bred stock justifies and in fact demands greater care to prevent disease and loss than is given grades for market purposes. The difference in feed, however, is slight since the best feed is usually the most profitable in producing market pork even on a very economical plan. The great problem of the breeder is marketing. One can sell pork for the market price at any time, but he has to make a particular effort to sell breeding stock.

MARKETING

Breeding hogs are usually marketed somewhere between three and twelve months of age with the larger part between five and ten months. Gilts are commonly sold after they have been bred and safe in pig. The beginner may thus buy only one animal yet in a few days have a whole litter. He will also not have to buy a boar until ready to breed for the second litter, and when purchased the boar may be used both on the original sow and upon the females of the first litter. A full herd is thus obtained with the purchase of but two animals. For these reasons bred gilts are very popular. They are usually about ten or eleven months old and due to farrow in a month or six weeks. If sold immediately after breeding the purchaser cannot be sure they are in pig, while if due to farrow in a few days they cannot be moved without danger. Boars and open gilts are usually marketed at not over nine months of age. Pigs of any kind over twelve months old are difficult to sell, and have consumed a large amount of feed.

Pure-bred swine may be marketed by private agreement between buyer and seller, by mail, or by public auction. Selling by mail is characteristic of the hog business, and while some breeders have been able to build up a considerable mail order trade there is room for much dissatisfaction in this method of marketing. Unscrupulous breeders sometimes take advantage of a customer to the detriment of the entire trade, while on the other hand amateur buyers commonly expect too much and are disappointed even with a really good pig worth more money than they paid. Pure-bred herds are now so well distributed throughout the West that there seems little reason to encourage marketing by mail. After a reputation for fair dealing has once been established, auctions are perhaps the best means of selling. Auctions enable the breeder to sell all his stock at one time and when they are in the best condition. He is thus enabled to adjust better both the management of his herd and his financial affairs. The objection most frequently offered is the uncertainty as to the price which will be received. A well advertised sale of good stock, however, is fairly sure to bring the market price. By private sale the breeder fixes his own prices, and this appeals very much to the average buyer. He cannot, however, avoid running up a big feed bill on stock which he does not sell when ready nor can he avoid selling some pigs for pork in case he overestimates the demand for breeding stock.

Good advertising is especially necessary in the pure-bred hog business. Competition is very keen, and buyers seldom have to look for what they want as they commonly do with sheep and cattle. Persistent newspaper advertising and successful showing are therefore necessary.

FITTING FOR SHOW OR SALE

It is demanded that animals brought into the show or sale ring be fat. Plenty of exercise during the fattening process will produce a firmer and smoother flesh than feeding in close confinement. The thinner animals are given the most concentrated and fattening rations, while those that are already fat are given feeds more bulky and less fattening. Oats in this case are used for the larger portion of the ration. Much skill and careful attention is required to get the hogs in condition at just the right time and to hold them in condition until after the show is over. Even more important than skill in feeding is good judgment as to how long it will take to get the animal in condition so as to know just when to start. Early in the fitting process the hogs should be dipped or scrubbed with some standard sheep dip. This, combined with good feed, should soon free the skin from scurf and dead hair. After this an occasional washing is given. The toes are trimmed to keep the feet square and the pasterns straight. When time for showing comes, little more need be done than to brush the hair clean. Sometimes the hair is treated with a mixture of sweet oil and gasoline or of separator oil and alcohol in order to produce a good luster. Black hogs are occasionally greased freely with crude oil. If the fitting has been conducted thoroughly from the start, only very coarse harsh-coated animals will be improved by these treatments.

AGE OF SHOW PIGS

All fairs have base dates from which the ages of the pigs are calculated. The usual dates are March 1st for spring pigs and September 1st for fall pigs although

these exact dates are not used by all fairs. The pigs must be farrowed as soon as possible after the base date in order that they may be shown with the greatest possible age, weight, and maturity. For example, pigs practically twelve months of age have a great advantage over pigs barely past six months, so much so that in hot competition it is a waste of time to exhibit short aged stock. It therefore becomes necessary to plan a long time ahead to have the stock of the right ages. Since the base dates are usually good farrowing dates for climatic reasons, the leading breeders try to have all their farrowing begin at this time regardless of the particular animals they wish to show.

GLOSSARY

GLOSSARY

GENERAL TERMS

Balanced ration. A ration suitable for the production of a given result without loss or excess of any nutrients.

Castration. The removal of the testicles, or sex glands, of the male.

Cod. The scrotum after the testicles have been removed by castration. The term is used most frequently in connection with steers and wethers.

Cross-bred. An animal whose sire and dam are of different breeds.

Docking. The practice of deducting from either the weight or the price of an animal at the time of sale for any purpose whatever. Cattle or sheep sold out of the feed lot when full of feed and water are commonly docked 4 per cent in order to give the buyers some compensation for the shrinkage which will occur in getting these animals to market. It is also customary to dock stags of all kinds.

Dressing percentage. The weight of the carcass of the animal expressed as a percentage of the live weight. In dressing beef and mutton, the head, hide, feet, and entrails are removed. The average dressing percentage of good steers is from 55 to 60 per cent and of cows 4 or 5 per cent less. Sheep dress 5 or 6 per cent less than cattle of similar condition. With hogs, only the hair and entrails are removed in dressing; good marketable hogs dress 75 to 80 per cent. Very poor or very good animals dress considerably more or less than the figures given.

Gestation period. The period intervening between the breeding of the female and the birth of the offspring. The length

of the period of gestation for different animals is approximately as follows: Horses, 11 months; cattle, 9 months; sheep, 5 months; swine, 112 days.

Grade. This term is often applied to any animal which is not pure-bred. It is more correctly used for stock that carries a considerable percentage of the blood of some one of the improved breeds, but that are not entirely of that breeding. Example: the offspring resulting from the breeding of pure-bred sires to common females.

In-breeding. Mating very closely related animals as full brother and sister.

Line-breeding. Mating animals that are related, but which are not as close as brother and sister.

Mongrel. An animal of nondescript or mixed breeding. Usually used in a derogatory sense.

Parturition. The act of giving birth to young. Includes the actual delivery of the offspring together with attendant pains and symptoms.

Prolificacy. The property of bearing numerous young.

Pure-bred. An animal carrying only the blood of some one breed. The dividing line between those that are pure-bred and those that are not is usually considered to be registration, or eligibility to registration, with the particular breed association having charge of the registration of animals of that particular breed.

Purse. Synonymous with cod.

Scrotum. The sack which contains the testicles of the male animal.

Scrub. An animal of inferior merit and usually of mongrel breeding.

Shrinkage. The loss of weight occurring in the driving, shipping, or handling of stock. Shrinkage is a particularly important item in the marketing, and must always be taken into consideration in comparing the prices a pound at home with the prices offered at the stock-yard. The word shrinkage is sometimes used as synonymous with docking as applied to weight.

Spaying. The removal of the ovaries or sex glands of the female.

Stag. A male animal of any kind that has been castrated

after he is old enough for more or less masculine character of the head and neck to become noticeable.

Staggy. Having the appearance of a stag. The degree of stagginess is of course controlled by the age at which the animal was castrated.

Thoroughbred. A term often used as synonymous with pure-bred, but generally considered as incorrect when so used. It is more properly used as the name of a breed of horses. It is also used in nontechnical literature to indicate any very high class animal.

BEEF CATTLE TERMS

Beef cattle. A stock-yard term used to designate all steers suitable for slaughter purposes, as distinguished from steers not fat enough or old enough to slaughter, and as distinguished from all classes of cows, heifers, and bulls.

Bos. Bos is the zoölogical name for the particular genus of the animal kingdom to which cattle of all kinds belong.

Bovine. Of or pertaining to cattle; derived from the word bos.

Butcher stock. A stock-yard term used to indicate all classes of cows, heifers, and bulls used for slaughter purposes. (*See* Beef cattle.)

Calf. The young animal of the bovine species without regard to sex, usually under twelve months of age. Animals born during any one calendar year are ordinarily called calves until some time the following spring.

Canners. A market class of very inferior cattle, usually old, thin cows, used for canning purposes.

Cow. The female of the bovine species after she has produced her first calf. Sometimes in the case of pure-bred herds the term cow is not applied until after the female has produced her second calf.

Durham. An old but now practically obsolete name for the Shorthorn breed of beef cattle.

Feeders. Steers that are not fat enough to slaughter, and yet are old enough and large enough to be ready to fatten off without further growth on range or pasture. Ordinarily steers that are two years old or over and weigh over 950 pounds will

be designated as feeders unless they are fat enough for slaughter, in which case they would be designated as beef cattle. (*See* Beef cattle.)

Heifer. The female of the bovine species that has not yet produced a calf. (*See* Cow.)

Polled. Without horns. This term is often used as a suffix to the name of some of the breeds of polled cattle, as for example, "Polled Angus," "Polled Hereford," or "Polled Durham."

Steer. A male animal of the bovine species which has been castrated before the animal is old enough to show any masculine character, as indicated by coarse head and heavy neck.

Stockers. Young growing cattle, including both steers and heifers; steers not old enough for feeders (*see* Feeders) and heifers not old enough to produce their first calf. The term, however, is sometimes used to include the entire breeding herd of cows as well as the young steers and heifers.

Veal. A young calf fat enough to slaughter, and weighing between 125 and 300 pounds live weight.

SHEEP TERMS

Binders. Cross fibers that hold the locks of a fleece together.

Blackface. A term applied to the Hampshire, Shropshire, and Oxford sheep or to lambs sired by rams of this breed. Blackfaced lambs are preferred in the feed-lot because the black face indicates the presence of this good mutton blood. (*See* Down breeds, also Middle wool.)

Brightness. A term referring altogether to the color of wool. It is quite distinct from the term luster.

Britch. That part of the fleece that covers the rear legs.

Broken mouth. A mouth in which one or more of the permanent incisor teeth are badly broken or missing.

Buck. A male sheep. This term is used largely in the range district. The word ram is preferable.

Crimp. The spiral or waves found in each fiber of wool.

Dock. The portion of the tail left after docking.

Down breeds. A term applied to certain of the middle wool breeds which developed on the rolling hills or downs of England. The Southdown, Shropshire, Hampshire, and Oxford are the principal Down breeds. (*See* Blackface, also Middle wool.)

Ewe. Female sheep.

Feeders. Lambs, wethers, or ewes not fat enough to slaughter but ready to be placed in the feed-lot. Lambs are the best feeders as they make the most economical gains.

Fine wools. A class of sheep producing the finest wool. It includes all the strains of the Merino and Rambouillet.

Four-year-old. A sheep past forty-eight months and having eight permanent incisor teeth.

Full mouth. A mouth which contains eight sound permanent incisors.

Gummy. An old ewe having a badly broken mouth.

Half-bred. The cross-bred offspring of a long wool ram and a fine wool ewe. This term is applied to the animal itself while the term "half blood" refers to a class of wool.

Hogget. A yearling sheep that has never been shorn. Hogg wool is the first fleece from a sheep.

Kemp. Dead fiber found in a fleece — found especially in goats.

Lamb. A sheep under twelve months of age and having no permanent teeth.

Legging out. The practice of separating sheep by catching each one by hand and pulling them out of the bunch. It is called legging out because the sheep are usually caught by the hind legs. The use of the dodging chute is a much better way of separating.

Long wool. A term applied to those breeds of sheep having a long fibered wool. The Long wool breeds include the Lincoln, Cotswood, Leicester, and Romney Marsh. The wool of these breeds is classed as braid.

Luster. A term referring to the glistening appearance of the fiber or wool when held to the light.

Middle wool. A class of sheep having wool between that of the long wool and the fine wool. It includes breeds of the very best mutton type, namely: Southdown, Shropshire, Hampshire, Oxford, Cheviot, Dorset, Suffolk, and Tunis. Wool from this class usually falls in the three-eighths blood and one-fourth blood classes. (*See* Blackface, also Down breeds.)

Ram. A male sheep.

Scurs. A horney growth taking the place of horns.

Short wools. A term applied to the fine wools.

Three-quarter-bred. The offspring of a "half-bred" ewe mated to a long wool ram. The animal is three-fourths Lincoln and in the United States is often called a quarter blood. The term quarter blood is more correctly used to designate a class of wool which very often comes from three-quarter-bred sheep.

Three-year-old. A sheep between the ages of thirty-six months and forty-eight months, and having six permanent incisor teeth.

Two-year-old. A sheep between the ages of twenty-four months and thirty-six months, and having four permanent incisor teeth.

Wether. A castrated male sheep.

Yolk. The natural oil or grease found in a fleece.

Yean. To bring forth a lamb; to lamb.

Yearling. A sheep between the ages of twelve months and twenty-four months, and having two permanent incisor teeth.

HORSE AND MULE TERMS

Burro. A small species of ass generally used as a pack animal.

Blemish. A scar, scratch, or the like, that is unsightly but does not injure the usefulness of the horse.

Bow-legged. Too wide apart at the knees, the opposite of knock-kneed.

Buck-knee. Knees bent forward when standing.

Calf-kneed. Knees bent too far back, the opposite of buck kneed.

Capped-hock. The point of the hock back of the web enlarged. Caused by a bruise of the bursa.

Cock-ankle. Standing bent forward on the fetlocks, more often on the hind legs.

Colt. A term commonly used to signify young horses of either sex, although technically speaking it refers to the male, while the female is commonly spoken of as filly.

Coupling. The space or connection between the dorsal vertebræ and the pelvis on top of the back. This is best measured by the distance of last rib from hip.

Cow-hocked. Standing with hocks together and hind toes out.

Crampy. Raising either one or both hind legs up with a jerk. More apparent when the animal has been standing and is cool.

Cribber. An animal having the vice of biting or setting the teeth against something and "sucking wind."

Cross firing. Hitting one of the fore feet with the opposite hind foot when traveling.

Curb. An injury or sprain of the ligaments at the back of the hock which usually causes an enlargement.

Curby hock. The back of the hock is rounding when viewed from the side.

Docked. Having the end of the tail cut off.

Donkey. An ass or mule.

Ewe neck. A deficiency of muscling causing a depression at the top of the neck just in front of the withers.

Filly. A female animal not yet of breeding age.

Filled-in hocks. May mean either bog spavins or thoropins, although most often the former.

Fistula. Fistulous withers. An abscess occurring in the region of the withers.

Foal. A young animal of either sex under one year of age.

Forging. Striking the front shoes with the toe of the hind ones.

Founder. Inflammation of the feet causing lameness. Technically known as laminitis.

Gelding. Male animal which has been castrated.

Heavey. Having the heaves.

Hipped. Having the point of one hip broken over so that it appears lower than when normal.

Hinney. A hybrid from stallion and jennet.

Horse. Used as either male or female, but technically as male.

Interfering. Striking the fetlock or cannon with the opposite foot as it passes, either in front or behind.

Jack. A bone spavin.

Jack. A male ass.

Jennet. A female ass, sometimes called jinnie.

Knee-sprung. Over on the knees caused by the relaxation of the extensor muscles. Sometimes spoken of as buck knees.

Knock-kneed. The front legs bent in at the knees with feet wide apart. Sometimes called bench-legged.

Mare. Female animal, although generally used after the animal is three years old or of breeding age. Previous to that time she is commonly known as a filly.

Moon blindness. Technically known as periodic ophthalmia. This is an affliction of the eyes which causes a sort of blue scum to cover over the pupil.

Mule. A hybird from jack and mare; females known as "mare mules," and males as "horse mules."

Overreach. Reaching farther forward with the hind feet in traveling than where the front feet were picked up.

Paddle. Throwing the front feet in when traveling.

Parrot mouth. The upper teeth extending over the lower ones.

Pink eye. A disease causing a white scum to form over the eye, often causing blindness.

Poll evil. A fistulous condition or abscess on or near the poll. (Top of the head.)

Posting. Rising and falling in the saddle with each alternate step when the horse is trotting.

Puffs. Wind galls, bog spavins, or thoropins.

Quarter crack. A vertical crack on the side of the hoof, often running to the coronet.

Quittor. A fistulous gathering upon the heel or coronary band of the foot.

Ringbone. A bony growth on the upper or lower pastern bones, and almost always causing lameness.

Roarer. Defective in wind.

Shoe boil. A bruise at elbow which results in an abscess.

Sickle hock. Too much bend in the hock. A conformation predisposed to curbs.

Side bone. An ossification of the lateral cartilage, occurring on either side of the foot.

Slab-sided. Flat ribbed.

Sound. Free from any defect or injury which may interfere with the usefulness of the animal.

Splint. A bony growth on the cannon bone, occurring most often on the front legs and on the inside.

Stallion. A male horse, although commonly applied to a male colt only after he is of breeding age.

Stringy. Stringhalt. A convulsive action in the hind legs, flexing either one or both up with a jerk.

Stump sucker. A cribber.

Sweeney. Shoulder muscles shrunken away, causing a depression.

Thoropins. Puffiness occurring in the web of the hock.

Unsound. Not sound. (*See* sound.)

Wall-eye. The iris a pearly white color, due to a lack of pigment. Sometimes called glass-eye.

Windgalls. Puffs occurring at the upper part of the fetlock joints.

Windy. Whistling or roaring when exerted.

Whistler. Defective in wind.

Winging. Throwing the front feet out when traveling.

SWINE TERMS

Bacon. The belly or side of a pig which has been cured or smoked. Also the type of hog suited to the production of such meat.

Barrow. A male hog which has been castrated when quite young, before secondary sex characters have developed.

Berkshire. A breed of swine of English origin, but widely distributed at present; perhaps the most cosmopolitan breed in the world. Color black with six white points.

Black teeth. The tusks of small pigs, sometimes so long that they injure the udder of the sow and the jaws of other pigs with which they fight.

Block hog. A northwestern term applied to fat swine suitable to the fresh meat trade; a light butcher hog of the eastern market.

Boar. An entire male hog.

Brood sow. A female hog kept for the production of young.

Cholera, or *hog cholera.* A very infectious and fatal disease of swine. It is practically incurable but may be prevented by vaccination.

Crude oil. A petroleum product frequently used as an insecticide on swine.

Farrow. To give birth to young pigs.

Feeder. A young hog of suitable size and condition to make a market animal after about sixty days or less on full feed. Such a pig usually weighs 80 to 125 pounds.

Fender rail. A bar placed in the bed in a farrowing pen, to prevent the crushing of young pigs by their dams.

Gilt. A young female hog which has not produced young.

Hog. An American term applying to mature swine of either sex.

Pig. A young hog of either sex up to about eighty pounds. Commonly applied to all classes of swine, especially by the English.

Porcine. Of or pertaining to swine.

Pork. The edible flesh of the swine.

Self-feeder. A bin with trough attached and adjustment so that feed can run into trough as fast as removed by pigs.

Shote. A young hog of 80 to 125 pounds.

Sow. A female hog which has reached maturity.

Sus Indica. The Asiatic branch of the swine family.

Sus Scrofa. The European branch of the swine family.

Tankage. A packing-house by-product consisting of the residues from the production of lard, tallow, and grease, and used in pig feeding as a source of protein, as a balance to a grain or otherwise too carbonaceous a diet.

Weanling. A pig which has ceased to suckle and is able to eat solid feed. Roughly speaking, a weanling is between a suckling pig and a shote.

Worms. Round intestinal worms, *Ascaris Suis*, are the most common parasites of the digestive tract of pigs in the Northwest.

Yelt. English term for gilt.

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NOV 2 6 1917

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